Final

Environmental Assessment

Security and Traffic Upgrades

Peterson AFB, Colorado

November 2004

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE **NOV 2004**	2. REPORT TYPE	3. DATES COVERED **00-00-2004 to 00-00-2004**

4. TITLE AND SUBTITLE **Final Environmental Assessment: Security and Traffic Upgrades at Peterson AFB, Colorado**	5a. CONTRACT NUMBER 5b. GRANT NUMBER 5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER 5e. TASK NUMBER 5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Labat-Anderson Inc,8000 Westpark Drive Ste 400,McLean,VA,22102**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S) 11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT
Environmental Policy Act (NEPA) of 1969, as amended. This EA assesses the potential environmental impacts of implementing antiterrorism/force protection measures at the three entrance gates at Peterson Air Force Base and upgrading select roads for more efficient traffic flow. The Proposed Action would have short-term, but not significant, impacts on air quality from construction. The Action would confirm to the State Implementation Plan and is exempt from further conformity review. Impacts to geological resources would result from ground disturbance during construction, impacts would not be significant. Short-term impacts to surface water from erosion or storm water runoff would not be significant. No critical habitat, threatened or endangered species, or wetlands would be impacted as a result of the Action. There are no known cultural resources in the areas proposed for construction. The four acres to be acquired by the West Gate would be surveyed prior to construction. Construction equipment and associated traffic would generate short-term increases in noise during normal working hours. Noise increases would be below significance thresholds. No significant impacts to environmental justice were identified. Traffic flow at the West and North Gates and on Stewart Avenue would improve as a result of the Proposed Actions. In addition to the Proposed Action, alternatives were analyzed in the EA for the West Gate, Northeast Gate, and the No Action Alternative.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**182**	

COVER SHEET

Agency: U.S. Air Force

Title: Security and Traffic Upgrades at Peterson Air Force Base, Colorado.

Date: November 2004

Contact: Mr. Mark Mann, 21 CES/CEV, 580 Goodfellow Street, Peterson AFB, Colorado, 80914-2370. Telephone (719) 556-9328.

Designation: Final Environmental Assessment (EA)

Abstract: This Final EA has been prepared in accordance with the *National Environmental Policy Act* (NEPA) of 1969, as amended. This EA assesses the potential environmental impacts of implementing antiterrorism/force protection measures at the three entrance gates at Peterson Air Force Base and upgrading select roads for more efficient traffic flow.

The Proposed Action would have short-term, but not significant, impacts on air quality from construction. The Action would confirm to the State Implementation Plan and is exempt from further conformity review. Impacts to geological resources would result from ground disturbance during construction, impacts would not be significant. Short-term impacts to surface water from erosion or storm water runoff would not be significant. No critical habitat, threatened or endangered species, or wetlands would be impacted as a result of the Action. There are no known cultural resources in the areas proposed for construction. The four acres to be acquired by the West Gate would be surveyed prior to construction. Construction equipment and associated traffic would generate short-term increases in noise during normal working hours. Noise increases would be below significance thresholds. No significant impacts to environmental justice were identified. Traffic flow at the West and North Gates and on Stewart Avenue would improve as a result of the Proposed Actions.

In addition to the Proposed Action, alternatives were analyzed in the EA for the West Gate, Northeast Gate, and the No Action Alternative.

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FINDING OF NO SIGNIFICANT IMPACT AND FINDING OF NO PRACTICABLE ALTERNATIVE

FINDING OF NO SIGNIFICANT IMPACT (FONSI)
and
FINDING OF NO PRACTICABLE ALTERNATIVE (FONPA)
for
Security and Traffic Upgrades / Constructing a Bridge in the 100-year Floodplain
Peterson Air Force Base, Colorado

INTRODUCTION

The United States Air Force proposes to implement antiterrorism/force protection measures by upgrading security features at the North, West, and East Gates and widening and extending base roads on Peterson Air Force Base. Pursuant to Section 102(2)(c) of the *National Environmental Policy Act* (NEPA) of 1969 and the Council on Environmental Quality regulations (40 CFR Sec 1500-1508) implementing procedural provisions of NEPA the Department of Defense (DoD) gives notice that an environmental assessment (EA) has been prepared for the proposed construction of antiterrorism/force protection measures at Peterson AFB, attached and incorporated by reference. This document serves as both a Finding of No Significant Impact (FONSI) and a Finding of No Practicable Alternative (FONPA). This FONSI/FONPA has been prepared in accordance with Executive Order (EO) 11988, Floodplains Management. It is being prepared because a portion of the vertical piers supporting the bridge planned for construction at the West Gate would be constructed within the 100-year floodplain.

THE PROPOSED ACTION AND ALTERNATIVE ACTIONS

The following paragraphs describe the Proposed Action and Alternatives.

PROPOSED ACTION

In accordance with DoD Instruction 2000.16, *DoD Combating Terrorism Standards*, Air Force Instruction (AFI) 31-101, *The Air Force Installation Security Program,* and Air Force Handbook (AFH) 32-1084 *Facility Requirements,* DoD installations are required to implement antiterrorism/force protection construction standards and to develop protective measures for DoD assets. Currently, entrance gates do not have security features such as vehicle inspection facilities, facilities to inspect postal packages as they arrive at the gate, and turnaround areas for vehicles denied access to the base.

The Proposed Action consists of force protection upgrades to the East, West, and North Gates, widening Stewart Avenue near the West Gate (this includes constructing a bridge for additional lanes), extending Paine Street between Peterson Boulevard and Stewart Avenue, widening Stewart Avenue on Peterson East, realigning Stewart Avenue with Mitchell Street, and constructing a new gate in the northeast part of Peterson AFB to provide access to the Command area. A postal inspection facility would be constructed at the East Gate and vehicle inspection areas and truck turnaround areas would be constructed at the East, West, and North Gates. More detailed information on the Proposed Action can be found in Section 2.1 of the EA.

ALTERNATIVES

An alternative being considered for the West Gate bridge over Sand Creek is to construct a single-span bridge with no vertical support piers. Construction of this alternative would affect the floodplain. Stream bank stabilization would still be needed near the bridge approaches. Four potential alignment options are being considered for the Northeast Gate realignment. All options would require property purchase. The most viable option was carried forward and analyzed in the EA. Additional information can be found in Sections 2.1 and 2.2 of the EA.

NO ACTION ALTERNATIVE

Under the No Action Alternative the existing gates would continue to operate with no improvements or modifications to increase their capacity or security. The vehicle and postal inspection facilities at the East Gate and the vehicle inspection facility and visitor center at the West Gate would not be constructed. Air Force standards for enforcing security measures in all threat conditions would not be met under this alternative. Roads on base would not be extended or widened. Traffic conditions would continue at the same level of service for the short-term, but would worsen over time as additional personnel commute to the base and the new Command area. Portions of the traffic system are currently marginal and provide unacceptable service. Those conditions would continue or worsen under this alternative.

ENVIRONMENTAL EFFECTS

The environmental effects of the Proposed Action and Alternative are summarized below.

Air Quality. The Proposed Action would have short-term, but not significant, impacts on air quality generated by construction of security upgrades, road improvements, and operation of the facilities. The Proposed Action conforms to the State Implementation Plan and is exempt from further conformity review. Peterson AFB would remain below thresholds for Prevention of Significant Deterioration review requirements. The base would continue to be a minor source of hazardous air pollutants. Impacts from the West and Northeast Gate Alternatives would be similar to those under the Proposed Action. Air quality would not change under the No Action Alternative. Additional information can be found in Section 4.1 of the EA.

Geological Resources. Ground disturbance of up to 8 to 10 feet from construction would not have a significant impact on geology or soils. Best management practices to control water and wind erosion would be implemented in accordance with permit requirements. Impacts from the West Gate and Northeast Gate Alternatives would be similar to those under the Proposed Action. Geological resources would not be impacted under the No Action Alternative. Additional information can be found in Section 4.2 of the EA.

Water Resources. Excavations during construction would not have a significant impact on groundwater. Erosion or storm water runoff during construction would not have a significant impact on surface water. Placement of vertical piers for the bridge at the West Gate would impact less than one-half acre of the 100-year floodplain. Coordination with the U.S. Army Corps of Engineers was conducted regarding the floodplain near the West Gate project area. Once the design for the bridge is finalized further coordination with the USACE would take place. Additional information can be found in Section 4.3 of the EA.

Biological Resources. Impacts to biological resources would result primarily from excavation activities associated with the construction. The effects of construction would minimally impact vegetation and wildlife in the project areas. No critical habitat, threatened or endangered species, or wetlands would be affected by the Proposed Action, and following best management practices, no increases in noxious weed populations are expected. Therefore, impacts to biological resources would not be significant. Coordination was conducted with the U.S. Fish and Wildlife Service and the Colorado Division of Wildlife regarding swallows nesting near the bridge expansion at the West Gate. Impacts under the West and Northeast Gate Alternatives would be similar to those under the Proposed Action. Under the No Action Alternative, there would be no change in the biological environment of the project area. Additional information can be found in Section 4.4 of the EA.

Cultural Resources. There are no known cultural resources within the project areas. An archaeological survey would be conducted on any new land acquired by the base prior to construction. No significant impacts to cultural resources are anticipated from any of the Alternatives. Additional information can be found in Section 4.5 of the EA.

Noise. Construction would occur during daytime hours in different locations on base. Impacts would be short-term and limited to specific project areas. Noise generated from activities associated with the Proposed Action and Alternatives would be below significance thresholds. There would be no increase in noise levels under the No Action Alternative. Additional information can be found in Section 4.6 of the EA.

Environmental Justice. Activities related to the Proposed Action and Alternatives were evaluated to determine if they would disproportionately impact a minority population, low-income population, or children. None of the impacts from construction would be significant, and they would not disproportionately impact a minority population, low-income population, or children. No significant environmental justice impacts were identified. Additional information can be found in Section 4.7 of the EA.

Transportation. Short-term but not significant impacts would result primarily from temporary lane closures or detours during construction under the Proposed Action or Alternatives. Traffic flow at the West and North Gates, Command area, and on Stewart Avenue would improve after construction is complete. Under the No Action Alternative, traffic congestion would continue to worsen at all Gates. Additional information can be found in Section 4.8 of the EA.

There would be no significant **cumulative impacts**. Additional information can be found in Section 4.11 of the EA.

PRACTICABLE ALTERNATIVES AND ENVIRONMENTAL EFFECTS

EO 11988 provides that if a Federal government agency proposes to conduct an activity in a 100-year floodplain it will consider alternatives to the action and modify its actions, to the extent feasible, to avoid adverse effects or potential harm. Alternatives were considered to minimize impacts to floodplains and other environmental resources. An alternative being considered for the West Gate bridge over Sand Creek is to construct a single-span bridge with no vertical support piers. Construction of this alternative would impact approximately 0.1 acre or less of the floodplain. Stream bank stabilization would be needed near the bridge approaches.

The East Branch of Sand Creek is defined as waters of the U.S. and a 100-year floodplain has been delineated by FEMA. The Proposed Action includes constructing a bridge over the creek, within the 100-year floodplain. USACE nationwide permits (NWP) 13, 14, and 33 would be needed to construct the bridge. NWP 13 governs bank stabilization for erosion control for projects not exceeding 500 feet in length. Up to one cubic yard of material per linear feet of stream can be placed on stream banks for stabilization under this permit. NWP 14 governs linear transportation projects, such as bridges. Any fill placed along the stream banks must not cause the loss of ½ acre or more of waters of the U.S. and must be limited to the minimum necessary for the crossing. Any permanent loss of waters of the U.S. must be compensated for as mitigation. NWP 33 regulates temporary structures, work, and discharges for dewatering (including cofferdams). Appropriate measures must be taken to maintain near normal downstream flows and to minimize flooding. Fill must be of materials, and placed in a manner, that will not be eroded by expected high flows. The use of dredged material may be allowed if it is determined by the District Engineer that it will not cause more than minimal adverse effects on aquatic resources. Temporary fill must be entirely removed to upland areas, or dredged material returned to its original location, following completion of the construction activity, and the affected areas must be restored to the pre-project conditions.

General Condition 26 of the NWP requires the permittee to construct the activity in accordance with FEMA or FEMA-approved local floodplain construction requirements to minimize adverse effects to flood flows in 100-year floodplains. The Pikes Peak Regional Floodplain Administration reviews proposed construction (including bridges) in floodplains within the County. The need for a permit depends upon the degree of impact to the floodplain from the bridge. The permit criteria is zero rise in the floodplain height or width. If the bridge design is such that the floodplain would rise in elevation or increase in width, a Conditional Letter of Map Revision for the FEMA floodplain map would be required

Mitigation required by the USACE permits for waters of the U.S. including floodplains (avoiding, minimizing, rectifying, reducing or compensating) would be necessary to ensure that the adverse effects to the aquatic environment are minimal. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the U.S. during periods of low-flow or no-flow. For NWP 14 (Linear Transportation Projects), the preconstruction notification must include a compensatory mitigation proposal to offset permanent losses of waters of the U.S. and a statement describing how temporary losses of waters of the U.S. will be minimized to the maximum extent practicable. For NWP 33 (Temporary Construction, Access, and Dewatering), the preconstruction notification must also include a restoration plan of reasonable measures to avoid and minimize adverse effects to aquatic resources. To the maximum extent practicable, the activity must be designed to maintain preconstruction downstream flow conditions (e.g., location, capacity, and flow rates). Any sediment discharged must meet standards for ambient concentrations of toxic pollutants as defined under 40 CFR 401.15.

AFI 32-7064, *Integrated Natural Resources Management*, lists three criteria that must be met for the USAF to construct in a floodplain: evaluate and document the potential effects of such actions through the environmental impact analysis process; consider alternatives to avoid these effects and incompatible development in the floodplain; and design or modify actions in order to minimize potential harm to or within the floodplain. These criteria have been met, and proposed measures to minimize harm to floodplains are documented in the EA.

This EA and FONSI/FONPA satisfy the requirements of AFI 32-7064.

Finding of No Significant Impact

Based on the attached EA, conducted in accordance with the Council on Environmental Quality Regulations implementing the *National Environmental Policy Act* of 1969, as amended, and 32 CFR 989, 15 Jul 99, and amended 28 Mar 01, an assessment of the identified environmental effects has been prepared for the proposed security and traffic upgrades. I find that the action will have no significant impact on the quality of the human environment; thus, an Environmental Impact Statement is not warranted.

Finding of No Practicable Alternative

Pursuant to EO 11988, and taking the above information into consideration, I find that there is no practicable alternative to this action and that the Proposed Action includes all practicable measures to minimize harm. In accordance with EO 11988, Section 2(a)(2), the Peterson AFB environmental section will send notice of the Proposed Action to the USACE.

This combined FONSI/FONPA was reviewed and approved by the chairperson of the Environmental Protection Committee at Peterson AFB.

RJSWM

RICHARD E. WEBBER
Brigadier General, USAF
Commander

8 Feb 05

Date

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ACRONYMS AND ABBREVIATIONS

ACRONYMS/ABBREVIATIONS

AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
AFH	Air Force Handbook
AFI	Air Force Instruction
APEN	Air Pollutant Emissions Notice
AQCR	Air Quality Control Region
CAA	Clean Air Act
CAAQS	Colorado Ambient Air Quality Standards
CEQ	Council on Environmental Quality
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
CNHP	Colorado Natural Heritage Program
CO	Carbon monoxide
dB	Decibel
dBA	A-weighted decibel
DoD	Department of Defense
EA	Environmental Assessment
EO	Executive Order
°F	Degrees fahrenheit
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FPCON	Force Protection Conditions
FY	Fiscal year
HAP	Hazardous air pollutants
IRP	Installation Restoration Program
L_{dn}	Day-night average sound level
L_{eq}	Equivalent sound level
LOS	Level of Service
MCL	Maxiumm contaminant level
MSL	Mean sea level
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System

NRCS	National Resource Conservation Service
NWP	Nationwide Permit
NWS	National Weather Service
O_3	Ozone
Pb	Lead
PCB	Polychlorinated biphenyl
PM_{10}	Particulate matter 10 microns in diameter
$PM_{2.5}$	Particulate matter 2.5 microns in diameter
PPACG	Pikes Peak Area Council of Governments
ppm	Parts per million
PSD	Prevention of Significant Deterioration
SIP	State Implementation Plan
SO_x	Sulfur oxide
SO_2	Sulfur dioxide
SWPPP	Storm Water Pollution Prevention Plan
TLF	Temporary living facility
TRB	Transportation Research Board
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USBC	United States Bureau of Census
USC	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile organic compound

CHAPTER 1

PURPOSE AND NEED FOR ACTION

1. PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

This environmental assessment (EA) is being prepared to evaluate the potential for environmental consequences from security and traffic upgrades at Peterson Air Force Base (AFB), Colorado. This section includes an introduction, Federal environmental requirements, describes the purpose and need for the action, and the public scoping process.

Peterson AFB is located in central Colorado on the southeast side of Colorado Springs in El Paso County (see Figure 1.1-1). The base is bordered by the Colorado Springs Municipal Airport on the south, Platte Avenue (U.S. Highway 24) on the north, Powers Boulevard on the west, and Marksheffel Road to the east. Peterson AFB is accessible via U.S. 24 and Stewart Avenue. Peterson East is accessible from Marksheffel Road. The base encompasses approximately 1,295 acres of land—184 acres fee owned and 1,094 acres leased from the City of Colorado Springs. The action is proposed for various areas on Peterson AFB. The East, West, and North Gates are shown in Figure 1.1-1. The East Gate is in an area of limited development, currently bordered on all sides by undeveloped land. The West Gate is nearly surrounded by undeveloped land, the only development being an industrial and administrative area to the southeast. The North Gate is surrounded by administrative areas on-base to the south, and commercial and residential areas to the north (adjacent to the gate and across U.S. Highway 24).

The U.S. Air Force proposes to implement antiterrorism/force protection measures by upgrading security and traffic management features at all three existing gates (also known as entry control facilities) at Peterson AFB. Antiterrorism/force protection measures would be implemented to heighten security of incoming vehicle traffic, restrict overall installation access, and provide the installation with the resources to establish heightened security measures during increased threat levels as determined by the U.S. Department of Homeland Security. In addition to the security upgrades planned on base, traffic upgrades include establishing a new gate for the Command area (Buildings 1, 2, and 3) of the base, extending Paine Street to provide a more direct route from the Command area to Peterson East, realigning Stewart Avenue and Mitchell Street, and widening Stewart Avenue on Peterson East to support future development.

1.2 FEDERAL ENVIRONMENTAL REQUIREMENTS

The *National Environmental Policy Act* (NEPA) of 1969, as amended, requires Federal agencies to consider environmental consequences in their decision-making process. The President's Council on Environmental Quality (CEQ) issued regulations to implement NEPA that include provisions for both the content and procedural aspects of the required environmental analysis. The Air Force environmental impact assessment process is accomplished through the adherence to the procedures set forth in CEQ regulations (40 Code of Federal Regulations (CFR) 1500-1508) and 32 CFR 989, 15 Jul 99, and amended 28 Mar 01 (*Air Force Environmental Impact Analysis Process*). These Federal regulations establish both the administrative process and substantive scope of the environmental

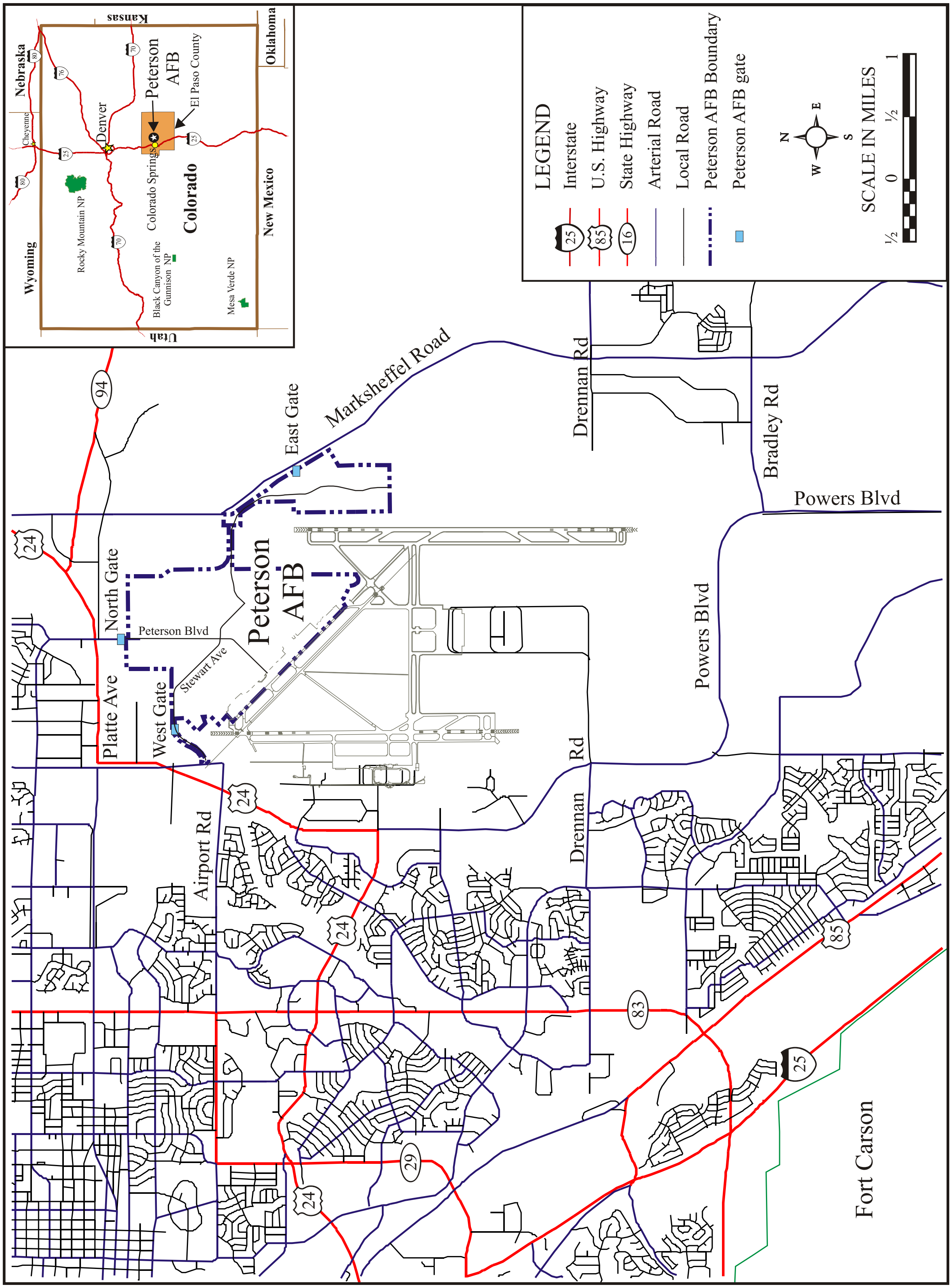

Figure 1.1-1. Location of Peterson AFB

impact evaluation, designed to ensure deciding authorities have a proper understanding of the potential environmental consequences of a contemplated course of action. This EA provides an analysis of potential environmental consequences that could result from the implementation of the Proposed Action, Northeast Gate Alternatives, or the No Action Alternative. Appendix A provides a brief summary of the laws, regulations, executive orders, and federal permits that may be applicable to this project.

1.3 PURPOSE AND NEED FOR ACTION

In accordance with Department of Defense (DoD) Instruction 2000.16, *DoD Combating Terrorism Standards*, Air Force Instruction (AFI) 31-101, *The Air Force Installation Security Program*, and Air Force Handbook (AFH) 32-1084, *Facility Requirements*, DoD installations are required to implement antiterrorism/force protection construction standards and to develop protective measures for DoD assets. Currently, the existing gates do not have security features such as vehicle inspection facilities (including trucks) and turnaround areas for vehicles denied access to the base. Peterson AFB does not currently have a facility to inspect postal packages as they arrive at a gate. The proposed security upgrades would enable Peterson AFB to comply with DoD and Air Force standards for security and to provide measures to enforce security in all threat conditions, including increased identification checks and vehicle inspections.

The three existing gates were designed and constructed under force protection conditions (FPCONs) Normal and Alpha. Under these conditions, routine identification of vehicles entering the base is confirmed by inspection of vehicle stickers or visitor passes. Peterson AFB has chosen to implement antiterrorism/force protection measures, in accordance with AFH 32-1084 and AFI 31-101, by modifying entry gates to provide the necessary features to operate under all FPCONs. Heightened FPCONs (Bravo through Delta) require identification of all people entering the base, inspection of vehicles and their contents, and measures to control traffic, such as barricades, and limiting the personnel entering the base. The entry gates need to be modified to meet the requirements of all FPCONs to provide areas for vehicle inspection, increased surveillance of vehicles entering the base, and turnaround areas for vehicles denied entry to the base.

Peterson AFB is also proposing to construct an additional gate to provide access to the Command area of the base. This would reduce congestion at existing gates and provide direct access to the Command area for personnel working in that area of the base.

In addition to security upgrades at the three existing gates, traffic flow at the West and North Gates would be improved through proposed enhancements to roads providing access to the Gates. Stewart Avenue would be widened from three to six lanes. This would include constructing a new bridge across the East Fork of Sand Creek (north of the existing bridge) to support these additional lanes. Peterson Boulevard would be reconfigured in the vicinity of the North Gate to provide more stacking room for vehicles entering the base. These proposed improvements would improve the traffic flow in these locations. Traffic currently is delayed by up to an hour or more at peak hours during heightened security. The Proposed Action would reduce delays which can potentially impact base operations.

The base proposes to extend Paine Street from south of the Command area (Bldgs 1, 2, and 3) area to Stewart Avenue. The development of the Command area on the northeast side of the base has increased the traffic volume at the North Gate and on Peterson Blvd and Stewart Avenue, especially from the west-to-east direction. The proposed road extension is necessary to alleviate traffic congestion at the North and West Gates and facilitate the flow of business traffic in the east/west direction without impacting community areas. According to the 1999 traffic study, level of service (LOS) for the North and West Gates are at LOS F. Traffic has increased at the East Gate since the opening of Bldg 1. Currently, traffic entering the East Gate and commuting to the Command area must travel west on Stewart Avenue and then north on Peterson Blvd. This route carries vehicles past the Base Chapel, Child-Care Center, Military Family Housing, Temporary Lodging Facilities, Youth Center, Visiting Officers Quarters, Officers Club, and Base Auditorium.

1.4 PUBLIC REVIEW PROCESS

The Draft EA and Finding of No Significant Impact (FONSI) were available for 30-day public review from October 8, 2004 through November 8, 2004 at the East Library Reference Desk and the Penrose Library Local History Desk.

CHAPTER 2

DESCRIPTION OF THE ALTERNATIVES INCLUDING THE PROPOSED ACTION

2. DESCRIPTION OF THE ALTERNATIVES INCLUDING THE PROPOSED ACTION

This section describes the Proposed Action, West Gate Alternative, Northeast Gate Alternatives, and the No Action Alternative.

2.1 PROPOSED ACTION

The Proposed Action consists of force protection upgrades to the East, West, and North Gates, widening Stewart Avenue near the West Gate (this includes constructing a bridge for additional lanes), extending Paine Street between Peterson Blvd and Stewart Avenue, widening Stewart Avenue on Peterson East, realigning Stewart Avenue with Mitchell Street, and constructing a new gate in the northeast part of Peterson AFB to provide access to the Command area. A postal inspection facility would be constructed at the East Gate and vehicle inspection areas and truck turnaround areas would be constructed at the East, West, and North Gates.

2.1.1 Gate Upgrades

As part of the Proposed Action, security upgrades would be implemented at the East, West, and North Gates. The improvements would be designed in accordance with the Air Force *Installation Entry Control Facility Design Guide* to the extent practical, and in accordance with DoD Instruction 2000.16, *DoD Combating Terrorism Standards*, AFI 31-101, *The Air Force Installation Security Program*, and AFH 32-1084, *Facility Requirements* in order to provide security in a range of threat environments. Improvements would also be made to increase traffic flow.

East Gate

The following improvements/facilities are planned for the East Gate.

- The access road through the East Gate would be widened by four feet to construct a four-foot median. Six vehicle barriers would be installed at the entrance to the gate consisting of hydraulically operated ramps to deny access to vehicles as needed. Excavations of four to six feet deep would be needed for installation of these barriers.

- An 80-foot by 80-foot vehicle inspection facility would be constructed north of the East Gate (see Figure 2.1-1 and Photos 1, 2, and 3 in Appendix A). The facility would include three bays to inspect trucks entering the base, heated office space, paved areas for truck parking, and a turnaround area for vehicles denied access to the installation.

- A postal parcel inspection facility would be constructed on the north side of the East Gate (to the north of the vehicle inspection facility). The facility would contain about 15,000 square feet of space and would include equipment to inspect all packages before they are delivered on-base. This facility would include vehicle

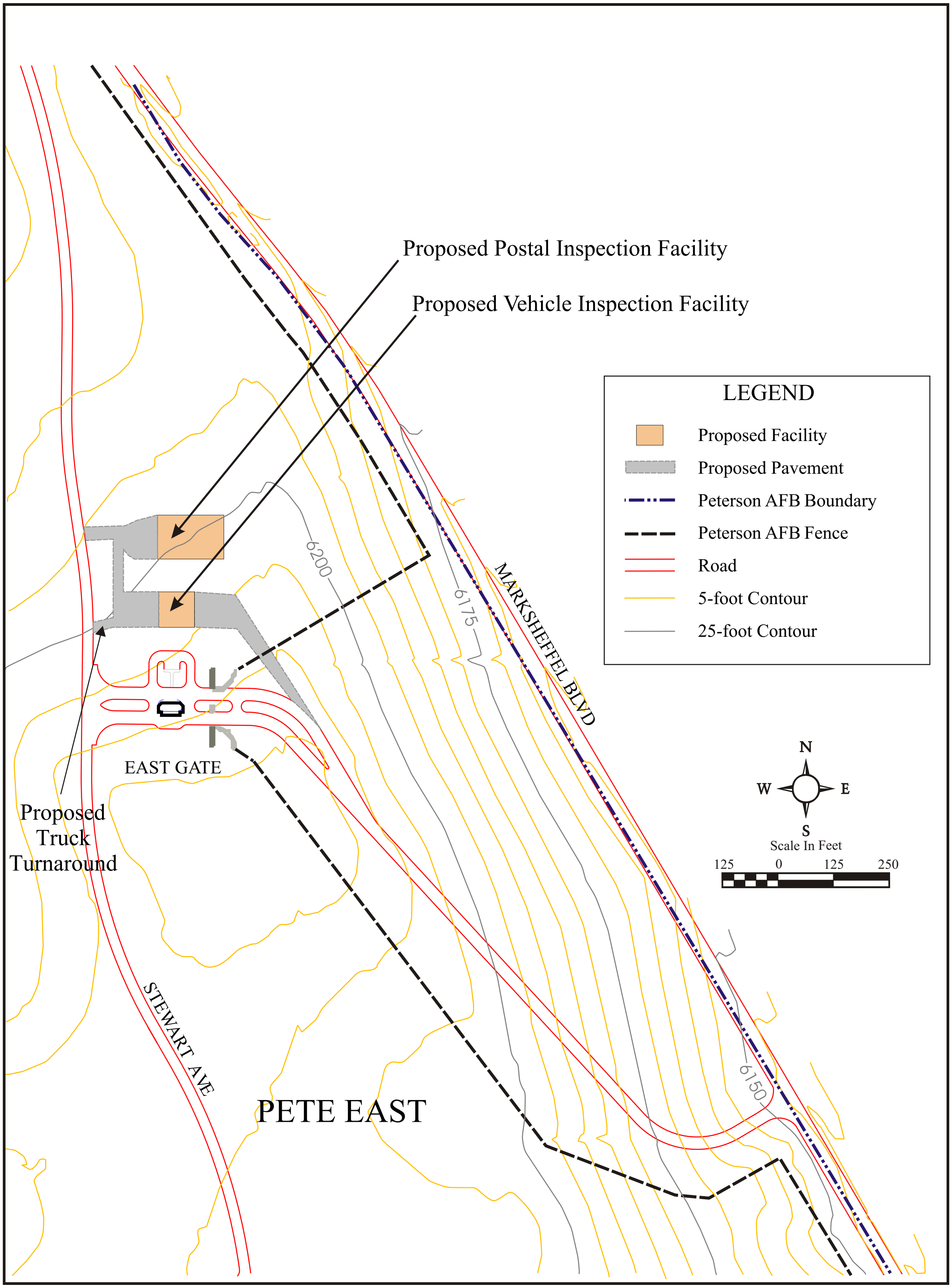

Figure 2.1-1. Location of East Gate Improvements

turnarounds for vehicles denied access to the base and a road connecting to Stewart Avenue. Curbs would be included on paved areas to channel storm water to drainage systems. Constructing these facilities would increase impermeable surfaces (pavement and roof areas) by about 1.5 acres and would disturb about 2.5 acres during construction. These facilities are programmed to be constructed in fiscal year (FY) 2005.

The operating hours at the East Gate would be increased from two hours during the morning and evening rush hours to 7:30 a.m. to 4:30 p.m. Current plans are to route all truck traffic to the East Gate. Traffic volume is anticipated to increase at this gate with the development of the Base Exchange/Commissary, postal inspection facility, and future programmed development on Peterson East.

West Gate

- The entry control point would be moved further into the base to allow construction of a vehicle inspection facility outside of the controlled base perimeter. The vehicle inspection facility, a guard house, and a visitor's center would be constructed north of the existing Stewart Avenue on 14 acres of land being acquired from the Cherokee Water District (see Figure 2.1-2). A parking lot (approximately 100 feet by 200 feet) would be constructed near the proposed visitor center.

- Stewart Avenue currently consists of three traffic lanes (two inbound and one outbound) which narrow to one lane of traffic in each direction at the West Gate. An additional three-lane bridge would be constructed over the East Fork of the Sand Creek on Stewart Avenue. The proposed bridge would be about 300 feet long and include two to four series of vertical piers for support, similar to the existing bridge (see Photos 4, 5 and 6 in Appendix A). Slopes near the bridge would be stabilized with boulders (see Photo 7 in Appendix A). About 0.2 acres of floodplain would be disturbed during construction. The design has not yet been completed for the proposed bridge, but it is likely that the stream channel would be disturbed by placement of vertical piers. Other than placement of these piers and minor grading for stream bank stabilization, it is not anticipated that the stream channel would be altered. The existing three lane bridge would be used for inbound traffic and the proposed new bridge would be used for outbound traffic.

- Stewart Avenue would also be reconstructed as a divided six-lane road from a point west of Sand Creek to its intersection with Paine Street (see Figure 2.1-2). Stewart Avenue would be realigned to allow traffic flow through a vehicle inspection facility, a visitor's center, and a new gatehouse. The proposed Stewart Avenue would be slightly elevated (about one to two feet) above the surrounding terrain. This could require the use of a minor amount of fill dirt, but grading within the area would accomplish most of the proposed elevation (Hub, 2004). Due to the realignment of Stewart Avenue, Goodfellow Street would dead-end near Building 1326.

- An existing outfall (storm drain outfall number 1) might need to be relocated north of the proposed bridge, depending on the final design of the bridge (see Photo 8 in Appendix A).

- An additional 4 acres of land would need to be acquired from the City of Colorado Springs (on the east and west sides of the creek). Existing utilities in the area would be relocated, and the existing guard shack (a temporary building) would be removed.

This West Gate project is currently planned for FY 2006. The West Gate improvements are designed to relieve congestion at the North Gate. Constructing these facilities would increase impermeable surfaces (pavement and roof areas) by about 10 acres and would disturb about 22 acres during construction.

North Gate

The entrance road into the North Gate (Peterson Boulevard) would be realigned to create more stacking room for vehicles entering the base. Currently, congested traffic backs up to the off-ramps of Highway 24. A vehicle inspection facility would be constructed on the west side of this gate. Figure 2.1-3 illustrates the proposed changes at the North Gate. Constructing the vehicle inspection facility would increase impermeable surfaces (pavement and roof areas) by about 0.5 acres and would disturb about 1 acre during construction. Realigning the entrance road could potentially impact up to 10 acres. Improvements at the North gate have not yet been programmed.

2.1.2 Construct Northeast Gate

A new gate is proposed for construction near the northeast corner of the Command area (near Buildings 1, 2, and 3; see Figure 2.1-4). A two-lane access road would be constructed from Space Village Avenue to Patrick Street (at the northeast corner of the Command area). This gate would be designed to provide access to the Command area during duty hours. The gate would be designed and constructed in accordance with the Air Force Installation Entry Control Facility Design Guide to the extent possible in order to provide security in a range of threat environments. Constructing this gate and access road would require purchasing private property on the northern edge of the base (see Figure 2.1-4). The road would be two lanes, operated in one direction. During the morning peak period, traffic flow would be restricted to entering the base and during the afternoon peak, traffic would be restricted to exiting. The gate would be open only during the peak commute periods during the morning and afternoon for a total of four hours each day. This new gate would alleviate traffic congestion during the morning and evening rush hours at the North and West Gates. Construction of this gate and access road would increase impermeable surfaces (pavement and roof areas) by about 1.5 acres and about 3 acres would be disturbed during construction. This project has not yet been programmed.

2.1.3 Extend Paine Street to Stewart Avenue

As part of the Proposed Action, a four-lane 1,036-meter (3,400-foot) divided arterial road would be constructed to extend Paine Street to Stewart Avenue (see Figure 2.1-5). The

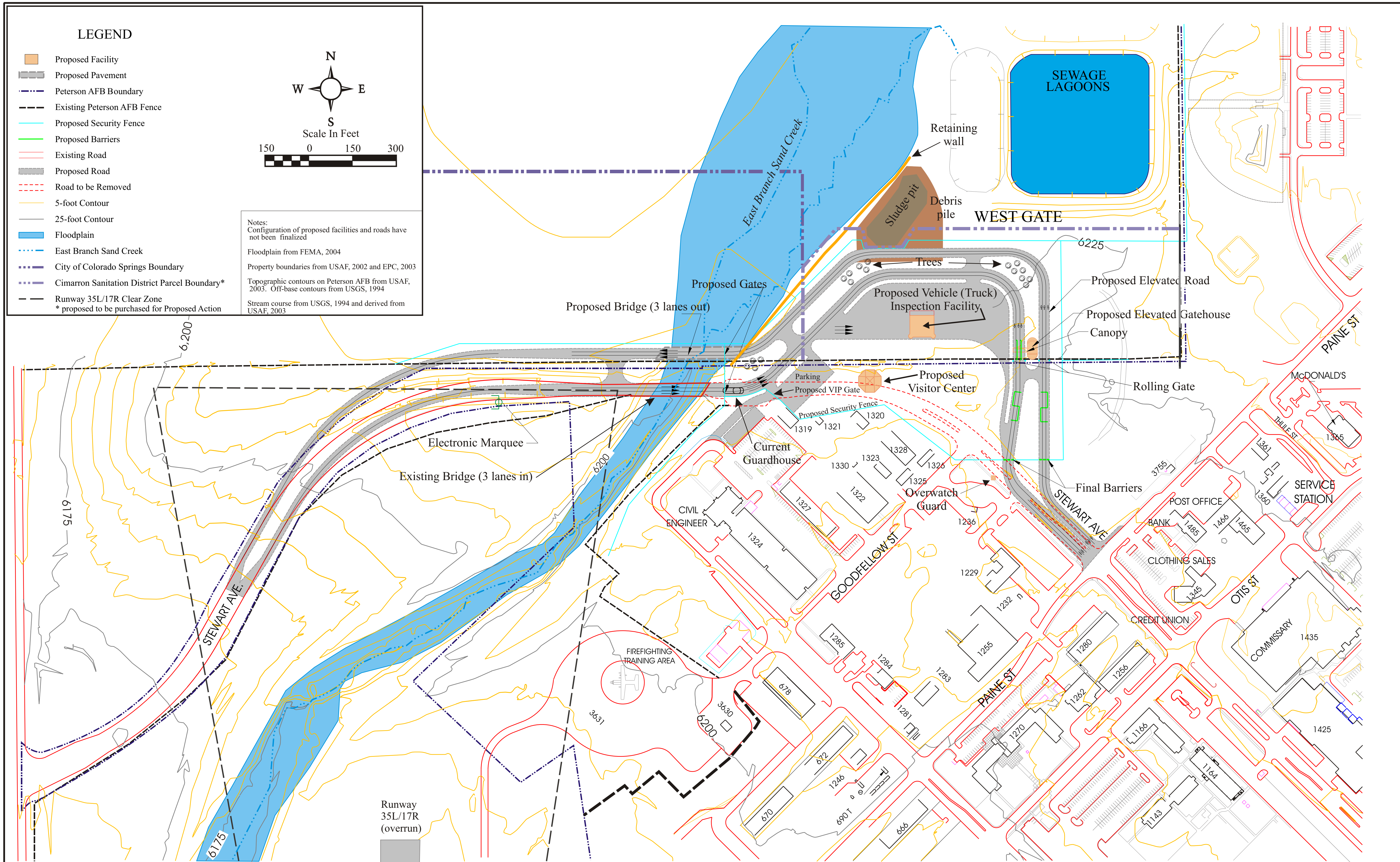

Figure 2.1-2. Location of West Gate Improvements

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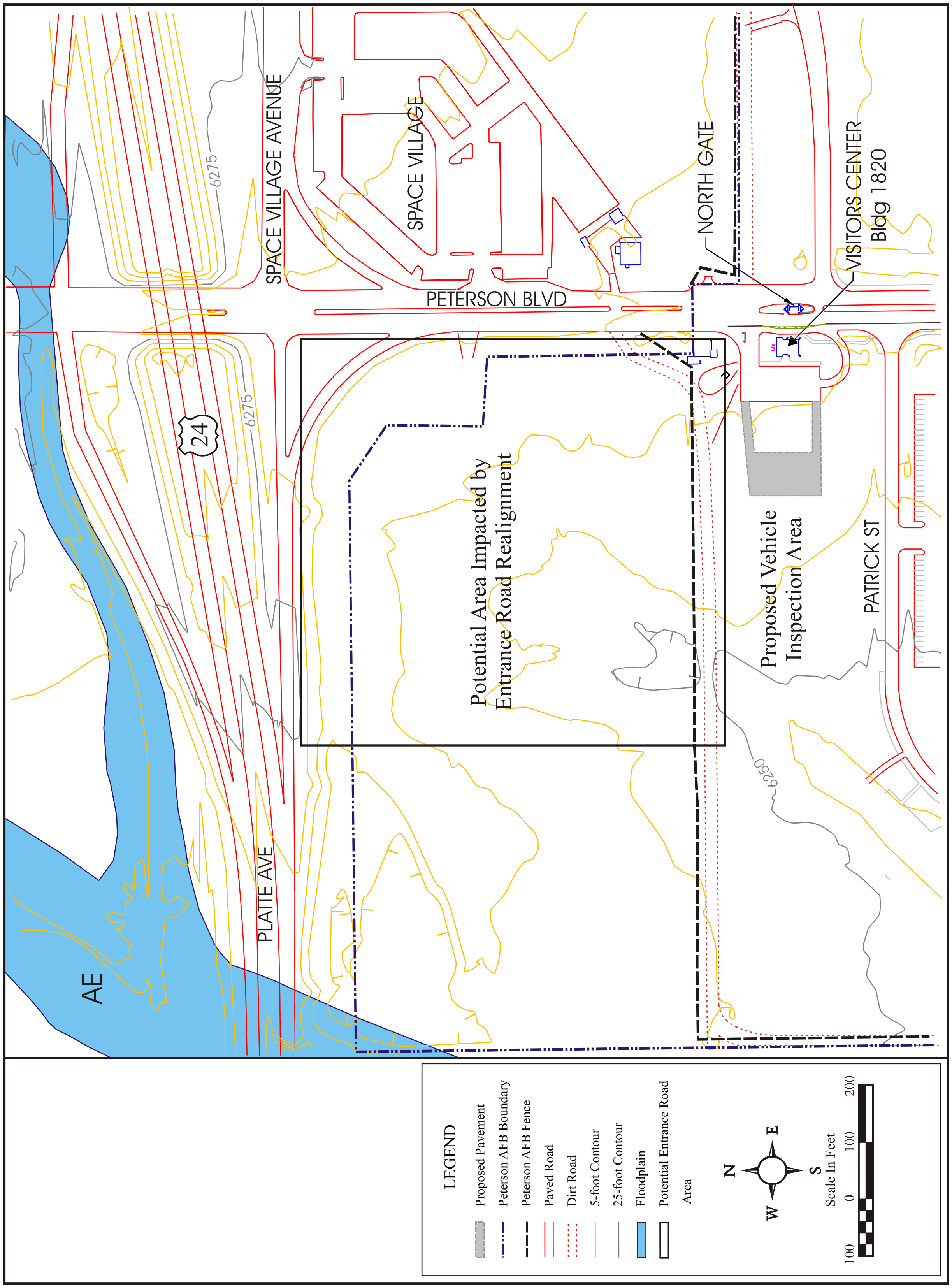

Figure 2.1-3. Location of North Gate Improvements

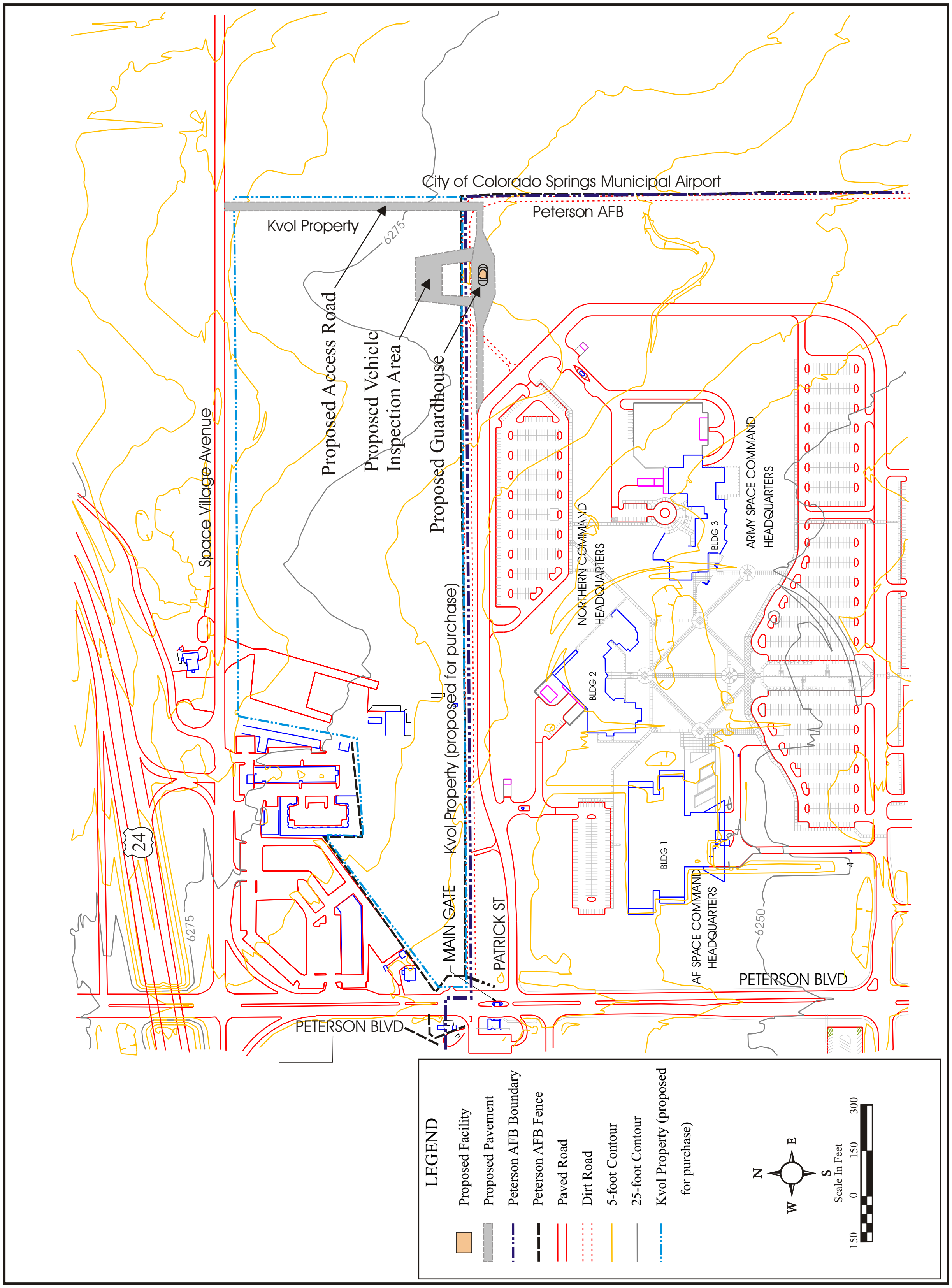

Figure 2.1-4. Proposed Northeast Gate and Access Road

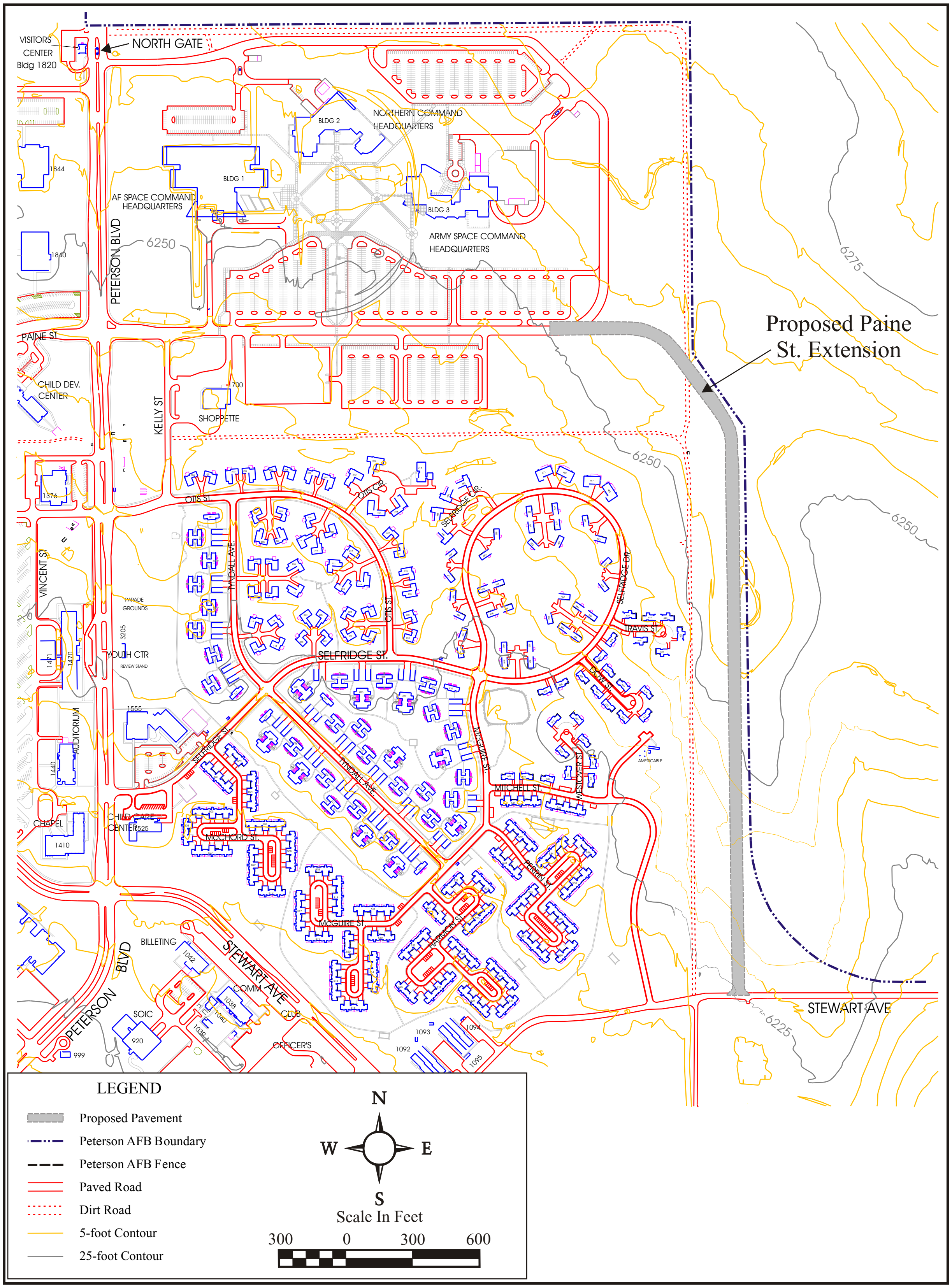

Figure 2.1-5. Proposed Paine Street Extension to Stewart Avenue

Proposed Action would include storm water drainage, lighting, irrigation, and curbing. This project would increase impermeable surfaces by about 5 acres and about 8 acres would be disturbed during construction. This project is scheduled for FY 2006 or 2007, and the estimated construction time is eight months.

2.1.4 Widen Stewart Avenue

As part of the Proposed Action, Stewart Avenue would be widened to four lanes from the proposed Paine Street extension to the proposed Base Exchange and Commissary (see Figure 2.1-6). Stewart Avenue would be rerouted in the vicinity of the Base Exchange and Commissary to accommodate construction of the parking lot further west (which would allow construction of the proposed buildings further west from an existing steep slope). About 8 acres would be disturbed from this project; impermeable surfaces would increase by about 4 acres. This project has not yet been programmed.

2.1.5 Realign Stewart Avenue with Mitchell Street

The intersection of Stewart Avenue and Mitchell Street (also referred to as Malmstrom Street) would be realigned to allow smoother traffic flow to Peterson East. The realigned Stewart Avenue would be widened to four lanes from just west of Mitchell Street to the extension of Paine Street (see Figure 2.1-7). The existing Temporary Living Facilities (TLF) (Buildings 1091, 1092, 1093, 1094, 1095, and 1096) would be demolished prior to constructing the proposed changes to Stewart Avenue and Mitchell Street. New TLFs would be constructed south of the existing facilities, between Stewart Avenue, Ent Avenue, Suffolk Street, and Mitchell Street. Demolition of existing TLFs and construction of new TLFs are not programmed as part of this project and would be assessed in separate NEPA documentation. This project would increase impermeable surfaces by about 4 acres, and about 6.5 acres would be disturbed during construction. The project has not yet been programmed.

2.2 DESCRIPTION OF ALTERNATIVES

Two alternatives being considered for the Proposed Action are discussed below.

2.2.1 West Gate Alternative

An alternative being considered for the proposed bridge over Sand Creek near the West Gate is to construct a single-span bridge with no vertical support piers. This alternative would affect the floodplain to a lesser extent (impacting 0.1 acres or less). Stream bank stabilization would still be needed near the bridge approaches.

2.2.2 Northeast Gate Alternatives

Four potential alignments (options) are being considered for this gate from Space Village Avenue to the east boundary of the base (USAF, 1999b) (see Figure 2.2-1). All four options are located on private or City of Colorado Springs property and would require a property purchase or an easement with the landowner. Option 1 was considered the most feasible and will be the option carried forward for analysis as part of the Proposed Action in this EA. Option 2 (south from Space Village Avenue on Airport land, then west to

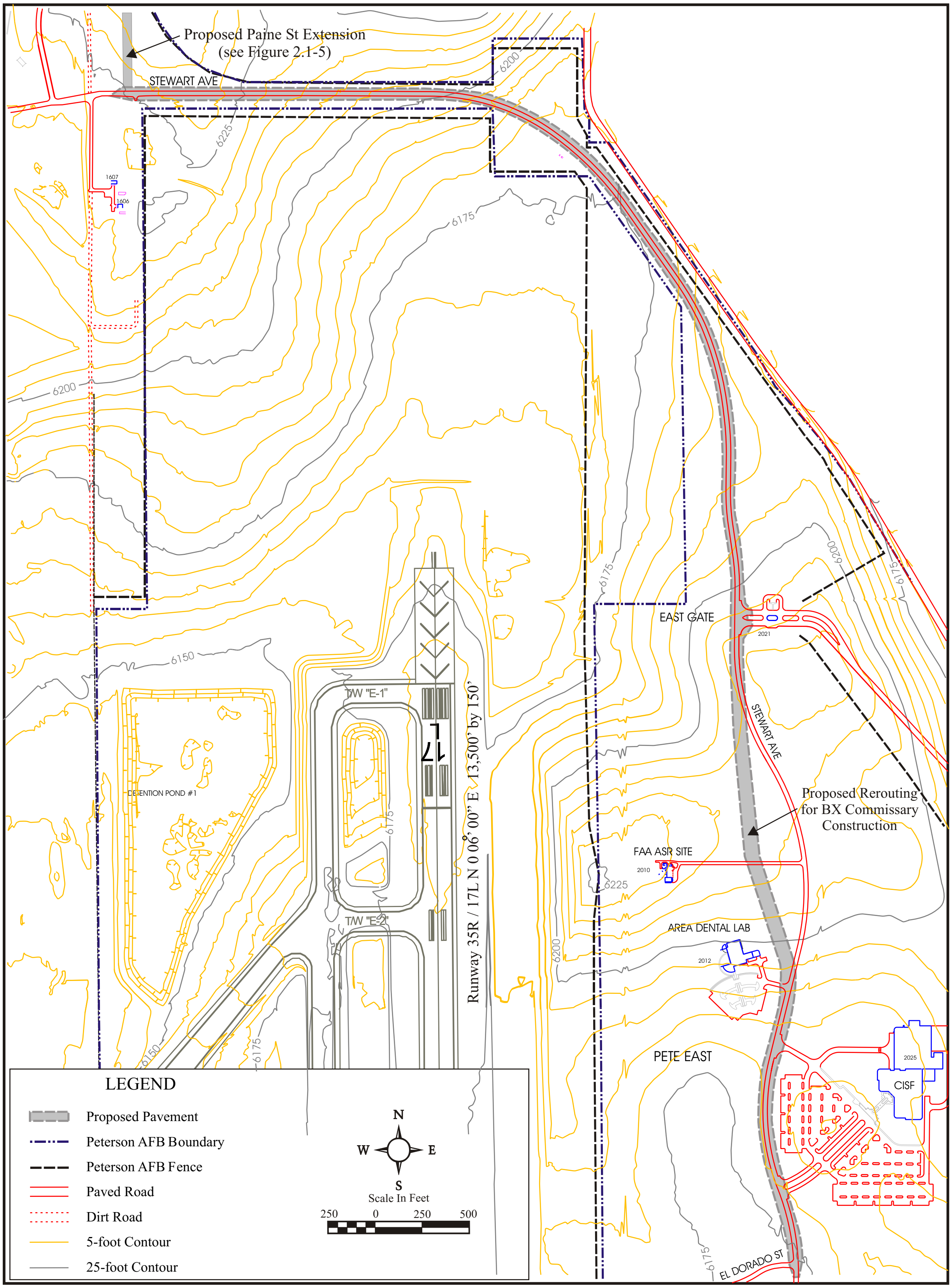

Figure 2.1-6. Proposed Widening of Stewart Avenue

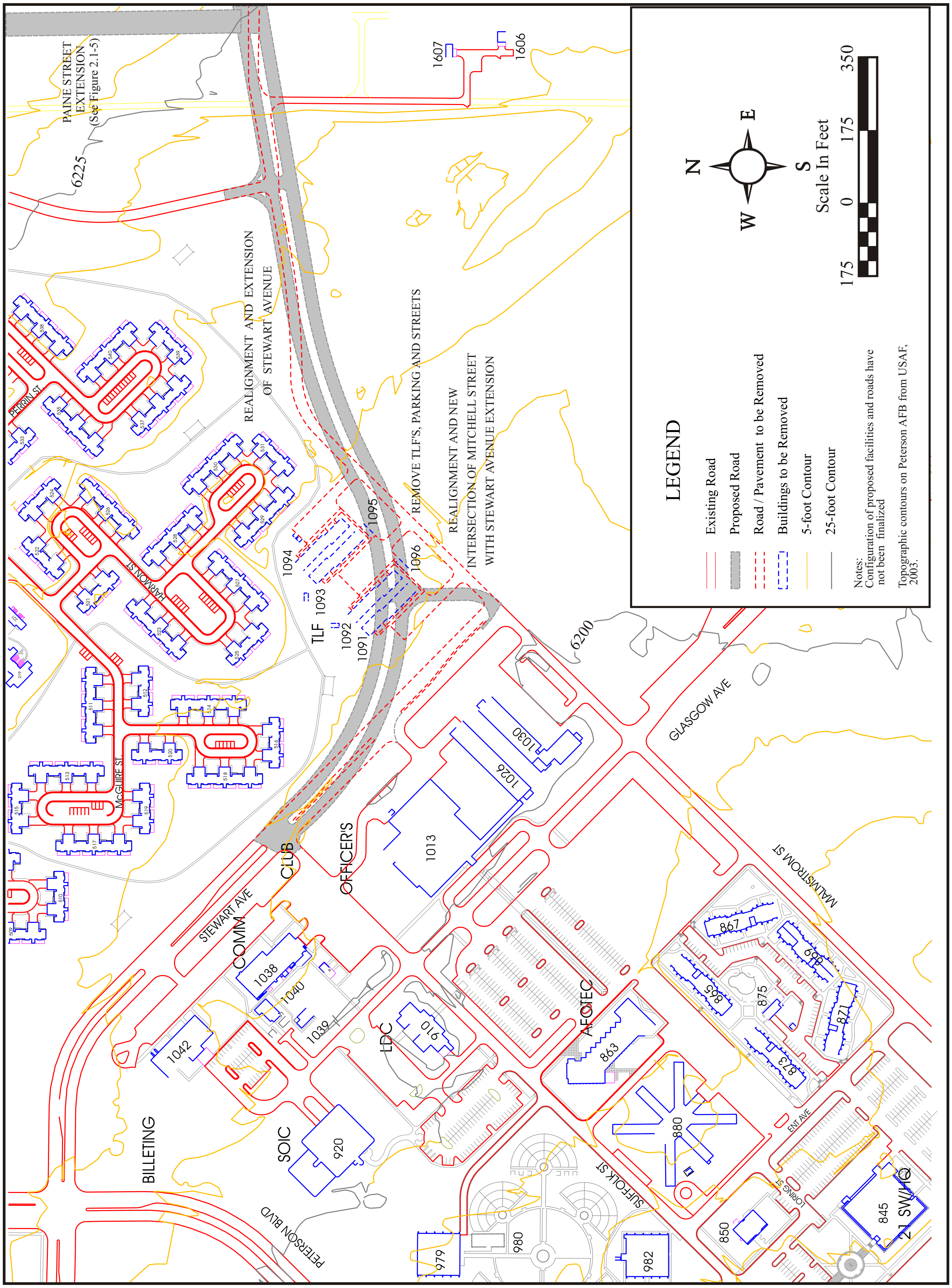

Figure 2.1-7. Stewart Ave and Mitchell Street Realignment

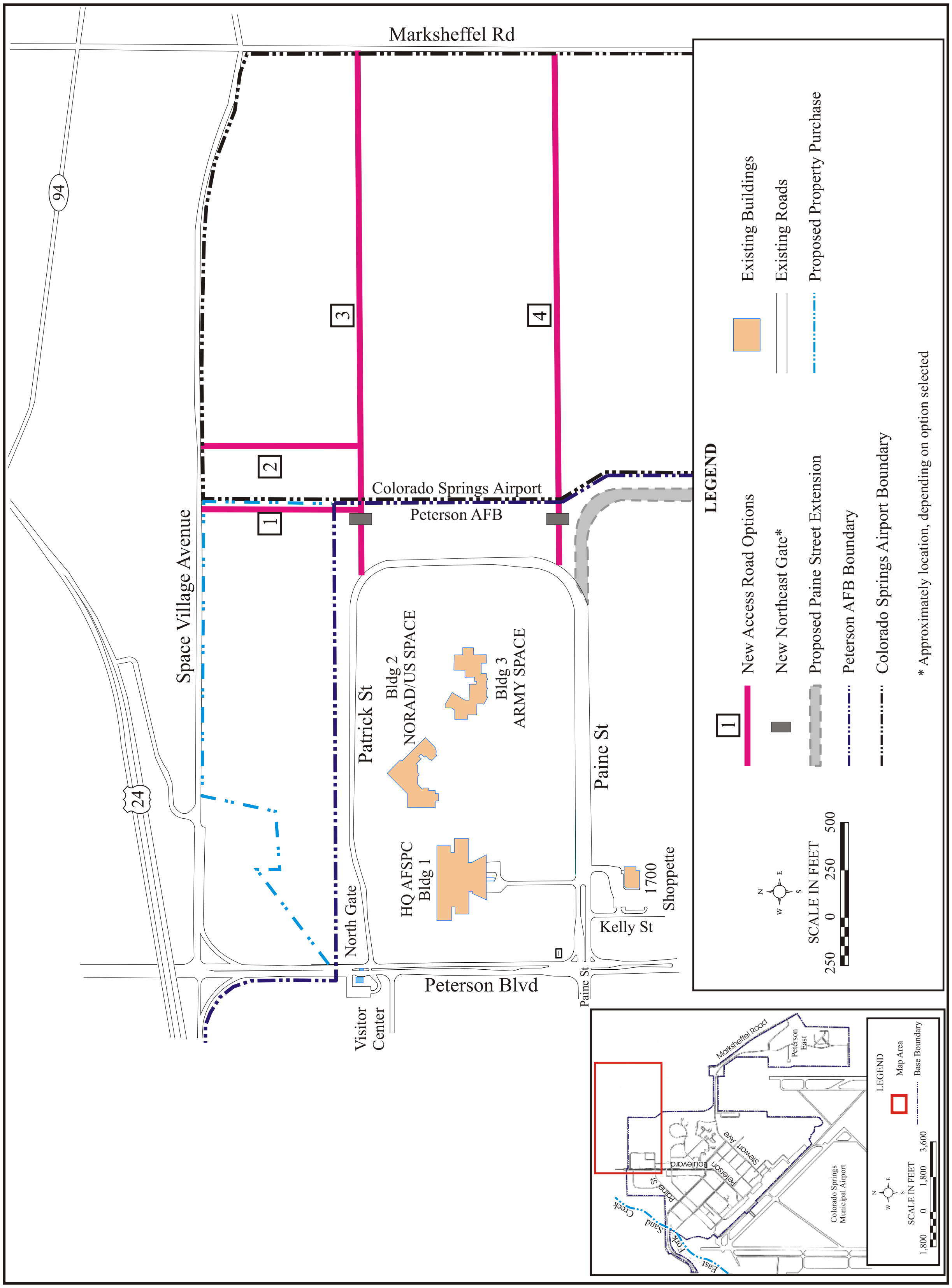

Figure 2.2-1. Options for the Northeast Gate Alternative

Patrick Avenue) would require a 1,500-foot access road (in addition to the gate in the same location as option 1). Impermeable surfaces would increase by about 2 acres, and about 4 acres would be disturbed during construction. Option 3 (west from Marksheffel Road to Patrick Street) would require a 2,700-foot access road (in addition to the gate in the same location as option 1). Impermeable surfaces would increase by about 2.5 acres, and about 5.5 acres would be disturbed during construction. Option 4 (west from Marksheffel Road to Paine Street) would require a 2,700-foot access road (in addition to a gate east of Paine Street). Impermeable surfaces would increase by about 2.5 acres, and about 5.5 acres would be disturbed during construction.

2.3 NO ACTION ALTERNATIVE

Under the No Action Alternative the existing gates would continue to operate with no improvements or modifications to increase their capacity or security. The vehicle and postal inspection facilities at the East Gate and the vehicle inspection facility and visitor center at the West Gate would not be constructed. Paine Street would not be extended from near Peterson Boulevard to Stewart Avenue, and Stewart Avenue would not be widened to Peterson East, or realigned with Mitchell Street. Traffic conditions would continue at the same LOS for the short-term, but would worsen over time as additional personnel commute to the base and the new Command area. Portions of the traffic system are currently marginal and provide unacceptable service. Those conditions would continue or worsen under this alternative.

CHAPTER 3

AFFECTED ENVIRONMENT

3. AFFECTED ENVIRONMENT

This chapter describes the environment in the project area (as appropriate), providing baseline information to allow the evaluation of potential environmental impacts that could result from the Proposed Action, West Gate Alternative, Northeast Gate Alternatives, and the No Action Alternative. As stated in 40 CFR Sec. 1508.14, the human environment includes natural and physical resources and the relationship of people to those resources. The environmental baseline resource areas described in this chapter were selected after identifying the potential issues and concerns of constructing security and traffic upgrades. In accordance with 40 CFR Sec. 1502.15, the resource areas that would not be impacted are not carried forward for further analysis. These resource areas are listed below, with a brief explanation for their omission from the analysis.

- **Socioeconomics.** There would be small beneficial impacts to local employment and income from the security and traffic upgrades. Construction jobs would most likely be filled by persons already living in the area, no increase in population is expected. Project engineers and other workers may travel to Colorado Springs and stay in the area for one or more nights, resulting in small beneficial impacts to local motels, restaurants, and other retailers. Overall impacts to the local economy would be small, but beneficial, and are not further analyzed.

- **Asbestos and lead-based paint.** The existing West Gate guard shack would be demolished as part of the Proposed Action. Surveys to determine the presence of lead-based paint have been conducted on Peterson AFB, however, the guard shack has not been surveyed. The shack was built in 1981 and is unlikely to contain either lead-based paint or asbestos. The shack would be surveyed for lead-based paint and asbestos before it is demolished. If lead-based paint or asbestos is found, the encapsulation, removal, and disposal of any asbestos-containing materials, and the removal of lead-based paint, would be performed by trained personnel in accordance with all applicable Federal, state, local, and Air Force regulations. The quantities encountered, if any, would be small and the duration short; therefore, the removal process would not produce any significant impacts.

- **Polychlorinated biphenyls (PCB).** Peterson AFB is PCB-free; therefore, PCBs will not be further analyzed.

- **Installation Restoration Program (IRP).** There are no IRP sites in the vicinity of the proposed security or traffic upgrades. Therefore, the IRP will not be further analyzed.

The resource areas that may be impacted by the Proposed Action, West Gate Alternative, Northeast Gate Alternatives, or No Action Alternative include air, geological, water, biological and cultural resources, environmental justice, and noise. The order of resource description is based on introducing the physical environment (air, geology, and water), the natural environment (biology), and the human environment (cultural, environmental justice, and noise). A brief summary of applicable laws and regulations that may be applicable to the Proposed Action is provided in Appendix B.

3.1 AIR RESOURCES

This section discusses the climate and meteorology of the area, air quality standards, existing air pollutant sources, and regional air quality.

3.1.1 Climate and Meteorology

Peterson AFB is located near the border of the Great Plains and the Front Range of the Rocky Mountains, which results in a moderate semi-arid climate. The average July temperature is 70° F and the average January temperature is 28° F. The area is subject to thunderstorms and heavy rainfall, which primarily occur from May through August. Mean precipitation is about 17.40 inches per year. Most rain occurs from March through September, with peak rainfall occurring in August (NWS, 2003). The most rainfall in a 24 hour period is 3.98 inches in August 1999. Total annual potential evaporation is about 25 inches. Net annual precipitation (precipitation minus evaporation) is minus 9 inches. Relative humidity ranges from about 55 percent in early morning to 35 percent in the early afternoon. Prevailing winds are predominantly from the north throughout the year. Wind speeds usually range from seven to ten knots (8 to 12 miles per hour), with the highest speeds occurring in the spring and the lowest in late summer and early fall.

3.1.2 Air Quality Standards

The National Ambient Air Quality Standards (NAAQS), established by the United States Environmental Protection Agency (USEPA), and adopted by the Colorado Department of Public Health and Environment (CDPHE), define the maximum allowable concentrations of pollutants that may be reached but not exceeded within a given time period. These standards were selected to protect human health with a reasonable margin of safety. Section 110 of the Clean Air Act (CAA) requires states to develop air pollution regulations and control strategies to ensure that state air quality meets the NAAQS established by USEPA. These ambient standards are established under Section 109 of the CAA, and they currently address six criteria pollutants. These pollutants are: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), lead (Pb), particulate matter, and sulfur dioxide (SO_2). Each state must submit these regulations and control strategies for approval and incorporation into the Federally enforceable State Implementation Plan (SIP). Exceeding the concentration levels within a given time period is a violation, and constitutes a nonattainment of the pollutant standard.

Particulate matter has been further defined by size. There are standards for particulate matter smaller than 10 microns in diameter (PM_{10}) and smaller than 2.5 microns in diameter ($PM_{2.5}$). Implementation of the $PM_{2.5}$ standards are being reviewed by the USEPA. The USEPA currently plans to designate areas for attainment status for $PM_{2.5}$ in December 2004. Table 3.1-1 presents the current NAAQS and the Colorado Ambient Air Quality Standards (CAAQS) for the six criteria pollutants.

Generally, criteria pollutants directly originate from mobile and stationary sources. Tropospheric O_3 is an exception, since it is rarely directly emitted from sources. Most O_3 forms as a result of volatile organic compounds (VOC) and nitrogen oxides (NO_x) reacting with sunlight. In 1997, an eight-hour average standard of 0.08 parts per million (ppm) was

Table 3.1-1
National Ambient Air Quality Standards (NAAQS)
and Colorado Ambient Air Quality Standards (CAAQS)

Pollutant	***Averaging Time***	***NAAQS $\mu g/m^3$ (ppm)[a]***		***CAAQS***
		Primary[b]	***Secondary[c]***	
O_3	1 hr 8 hr	235 (0.12) [d] 157 (0.08) [e]	Same Same	Same
CO	1 hr 8 hr	40,000 (35) [f] 10,000 (9) [f]	None None	Same
NO_2	AAM[g]	100 (0.053)	Same	Same
SO_2	3 hr 24 hr AAM	None [h] 365 (0.14) [h] 80 (0.03) [h]	1,300 (0.5) none none	700 $\mu g/m^3$ 100 $\mu g/m^3$ 15 $\mu g/m^3$
PM_{10}	24 hour AAM	150 [i] 50 [j]	Same Same	Same Same
$PM_{2.5}$	24 hour AAM	65 [i] 15 [j]	Same Same	None
Pb	¼ year	1.5 [k]	Same	Same

[a] $\mu g/m^3$ — micrograms per cubic meter; ppm — parts per million

[b] National Primary Standards establish the level of air quality necessary to protect the public health from any known or anticipated adverse effects of a pollutant, allowing a margin of safety to protect sensitive members of the population.

[c] National Secondary Standards establish the level of air quality necessary to protect the public welfare by preventing injury to agricultural crops and livestock, deterioration of materials and property, and adverse impacts on the environment.

[d] The EPA designated areas for attainment status for the eight-hour ozone standard on April 15, 2004. These designations will be effective June 15, 2004. The one-hour ozone standard for ozone will be revoked one year from this date.

[e] The 3 year average of the annual 4th highest daily maximum eight-hour average concentration is not to exceed 0.085 ppm

[f] Not to be exceeded more than once per year

[g] AAM —Annual Arithmetic Mean.

[h] Not to be exceeded more than once per calendar year

[i] The 3-year average of the 98th percentile of the readings are not to exceed the standard

[j] The 3-year average of the AAM is not to exceed the standard

k The Federal standard uses the quarterly AAM, the State standard uses the monthly AAM.

PM_{10} is particulate matter equal to or less than 10 microns in diameter

$PM_{2.5}$ is particulate matter equal to or less than 2.5 microns in diameter. This standard is in the process of being implemented.

Source: 40 CFR 50; Code of Colorado Regulations, Title 5, Chapter 1001, Regulation 14

adopted to replace a one-hour standard. The one-hour standard for ozone of 0.12 ppm was retained as a transition to the new eight-hour standard for those areas that were in nonattainment. The USEPA designated areas for attainment status for the eight-hour standard on April 15, 2004. The Colorado Springs area was designated as attainment.

All areas of the country are designated as attainment, nonattainment, or unclassifiable. Areas which meet the national primary and secondary ambient air quality standards are designated as attainment. Any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for any criteria pollutant is designated as nonattainment. Areas in nonattainment of ambient air quality standards must revise the SIP to achieve attainment, as outlined in Section 172 of the CAA.

When the USEPA certifies that a nonattainment area has achieved attainment of the NAAQS, the area is redesignated as attainment. "Each State which submits a request under Section 107(d) for redesignation of a nonattainment area for any air pollutant as an area which has attained the national primary ambient air quality standard for that air pollutant shall also submit a revision of the applicable SIP to provide for the maintenance of the national primary ambient air quality standard for such air pollutant in the area concerned for at least 10 years after the redesignation. The maintenance plan shall contain such additional measures, if any, as may be necessary to ensure such maintenance" (42 U.S.C. Sec. 7505).

Proposed Federal actions within a nonattainment or maintenance area must conform to the SIP. Conformity thresholds, as defined in 40 CFR 51, Subpart W, are used to determine conformity of an action with a SIP. The thresholds are determined by nonattainment or maintenance status. For nonattainment areas, the thresholds are determined by the severity of nonattainment. For maintenance areas, the thresholds are 100 tons per year of CO, NO_x, sulfur oxides (SO_x), and particulate matter. The threshold for VOC is 50 tons per year if the maintenance area is inside an ozone transport region or 100 tons per year if the maintenance area is outside an ozone transport region. These provisions are known as the General Conformity Rule.

The intent of conformity requirements is to ensure that Federal actions do not significantly affect the timely attainment and maintenance of air quality standards. As stated in Section 176 (c) (1) of the CAA (U.S.C. Sec. 7505a) "No department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve, any activity which does not conform to an implementation plan after it has been approved or promulgated under Section 110. The assurance of conformity to such an implementation plan shall be an affirmative responsibility of the head of such department, agency, or instrumentality. Conformity to an implementation plan means conformity to an implementation plan's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards; and that such activities will not cause or contribute to any new violation of any standard in any area; increase the frequency or severity of any existing violation of any standard in any area; or delay timely attainment of any standard or any required interim emission reductions or other milestones in any area." The CAA and USEPA have set specific guidelines and procedures for determining whether Federal actions conform to SIPs (including conformity thresholds). These procedures allow for flexibility by the states and regional USEPA offices in determining if a Federal action conforms with the applicable SIP.

Hazardous air pollutants (HAPs) are regulated under 40 CFR 61, *National Emission Standards for Hazardous Air Pollutants (NESHAP)* and 40 CFR 63, *NESHAP for Source Categories*. A major source, defined as one emitting, or having the potential to emit, 10 tons per year of any single HAP or 25 tons per year total HAPs, requires a permit, and as specified in 40 CFR 63, the implementation of maximum achievable control technology.

A minor source is defined as one emitting, or having the potential to emit, less than 10 tons per year of any single HAP or 25 tons per year total HAPs.

3.1.3 Air Pollutant Sources

Particulate matter (PM_{10} and $PM_{2.5}$) is generated during ground disturbing activities and during combustion. El Paso County requires an air quality permit for fugitive particulate emissions from disturbed ground of more than one acre in size. The permit includes requirements to limit fugitive dust through best management practices, outlined in the El Paso County Land Development Code (Section 51).

If this ground is disturbed for more than 6 months, and is 25 acres or more in size, a Colorado Air Pollutant Emissions Notice (APEN) is also required. The APEN would require specific measures to control fugitive dust to the extent technically feasible and economically reasonable. Specific measures are required for onsite unpaved roads (watering, chemical stabilizers, limiting vehicle speeds, or gravelling), controlling dust from disturbed areas (watering, chemical stabilizers, limiting vehicle speeds, revegetation, furrows, wind breaks, temporary compaction, or synthetic or natural covering, such as netting or mulching), and preventing mud and dirt from being carried out onto paved roads (gravel entryways, washing vehicle wheels, or street cleaning).

Limits for other criteria pollutants apply only to permanent stationary sources installed during construction. These limits are specified for attainment or nonattainment areas (*Code of Colorado Regulations*, Title 5, Chapter 1001, Regulation 3, Part A, II.B.62.a) and are two tons per year of any pollutant in an attainment area.

The principal source of CO and SO_2 is combustion. The precursors of O_3 (VOC and NO_2) are also primarily emitted from combustion. NO_x is primarily generated from boilers, furnaces, and water heaters. These emissions are generated at Peterson AFB by mobile sources, such as aircraft, vehicles, construction equipment, and stationary sources, such as boilers. VOCs are also emitted by vehicle refueling, storage tanks, and other stationary sources.

HAPs include a wide range of materials or chemicals that are toxic or potentially harmful to human health. While HAPs are found in numerous products and used in many processes, few types and small amounts of HAPs are generated during internal combustion processes or earth-moving activities.

3.1.4 Regional Air Quality

Peterson AFB is located in the Colorado Springs Metropolitan Area, which lies within the San Isabel Intrastate Air Quality Control Region (AQCR). The region is currently in attainment for all criteria pollutants, but has only been in attainment for CO since August 1999 (CAQCC, 2000). As part of the redesignation as an attainment area, the Colorado Springs area is under a maintenance plan (effective October 25, 1999) for 10 years to demonstrate compliance with the CO standard, as provided for in Section 110 of the CAA (42 U.S.C. Sec. 7410). Under this maintenance plan, implemented under a SIP and approved by the USEPA, the Colorado Springs Maintenance Area has a budget of 292.8 tons per day (106,872 tons per year) of CO.

The Colorado Springs Metropolitan Area is in maintenance for CO, but in attainment for other criteria pollutants; the conformity with the SIP is focused on CO.

According to the latest monitoring and trends report prepared by the Pikes Peak Area Council of Governments (PPACG, 2003), emissions of CO have declined since violations of the standard in 1988. Eight-hour average monitoring results are less than 6 ppm (compared to the eight-hour standard of 9.5 ppm). Emissions of other criteria pollutants are also well below standards, with the exception of ozone. Concentrations of ozone are currently about 85 percent of the standard. Though the 3 year average ozone level has stabilized, more data is needed before predicting future trends (PPACG, 2004; Muzzy, 2004).

Peterson AFB completed an Air Emissions Inventory for calendar year 2002 (USAF, 2003). The installation-wide criteria pollutant totals (actual and potential emissions) are shown in Table 3.1-2. Actual emissions were calculated with emission factors and actual usage times for equipment. As defined in 40 CFR 52.21, the potential to emit is the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. For purposes of potential to emit calculations, operating hours for emergency equipment (such as emergency generators) is limited to 500 hours per year by the USEPA. The base has a CAA Title V Operating Permit from the Colorado Air Pollution Control Division that is valid until March 2008 (CDPHE, 2003). Peterson AFB is a major stationary source, as the potential to emit NO_x, PM_{10}, and VOCs exceeds 100 tons per year. The base is not subject to Prevention of Significant Deterioration (PSD) review requirements of 40 CFR 52.21 and Code of Colorado Regulations, Title 5, Chapter 1001, Regulation 3, Part B, Section IV.D.3 because the actual or potential emissions of any criteria pollutant does not exceed 250 tons per year.

Table 3.1-2
Installation-Wide 2002 Air Pollutant Emissions at Peterson AFB
(values in tons per year)

Emissions[1]	PM_{10}	NO_x	SO_x	*CO*	*VOCs*	*HAPs*[2,3]
Stationary Sources, Actual	10.52	24.48	0.35	17.98	48.94	4.54
Stationary Sources, Potential	126.24	147.89	5.25	50.03	122.13	10.12

[1] PM_{10} emissions include 2.97 tons per year from construction emissions (a stationary fugitive source).
[2] The largest actual emission of a single HAP is 1.62 tons. The largest potential to emit of a single HAP is 4.57 tons.
[3] Included in HAPs is 10.95 pounds per year of lead compounds.
Source: USAF, 2003a.

Peterson AFB is a minor source of HAPs, with total emissions of 4.54 tons per year. HAPs emissions are below the thresholds for specific requirements under 40 CFR 61 and 63 for source categories. The base monitors the amount of HAP emissions and reports them to the State of Colorado in accordance with the operating permit. Most of the HAPs emissions are generated from gasoline storage tanks and refueling, and from chemical usage. The potential to emit HAPs at Peterson AFB is 10.12 tons per year.

3.2 GEOLOGICAL RESOURCES

Geological resources discussed in this section include physical features of the earth such as geology (surface and subsurface features), topography, and soils.

3.2.1 Geology and Topography

The project area is situated in the Colorado Piedmont section of the Great Plains Physiographic Province. The Southern Rocky Mountain Physiographic Province is located about 10 miles to the west. The Colorado Piedmont is a mature elevated plain, dissected by numerous streams. In the local area, this includes Fountain and Monument Creeks.

Overall, elevations in the project areas range from about 6,170 to 6,285 feet above mean sea level (MSL), with slopes ranging from about 1 to 30 percent. Elevations and slopes vary in each project area and are shown in Table 3.2-1. Steeper slopes (up to 30 percent) occur near the East Branch of Sand Creek and to the west of the creek.

Table 3.2-1
Elevations and Slopes in Areas Affected by the Proposed Action

Location	Elevations (ft)	Slope (percent)	Slope Direction
West Gate and Stewart Avenue	6,170 to 6,225	1.5 to 30	Southwest, except creek banks
North Gate	6,255 to 6,260	2 to 2.5	Southwest
Extend Paine Street	6,220 to 6,260	1 to 21	West, southwest
Realign Stewart and Mitchell	6.200 to 6,225	1 to 4	Southwest
Northeast (Command Area) Gate	6,270 to 6,285	1.5 to 5	Southwest
Widen Stewart Avenue	6,175 to 6,230	1 to 5	Southwest, southeast, northwest
East Gate	6,195 to 6,210	3 to 9	Northwest, northeast

Source: USAF, 2003d

The project area is underlain by about 100 to 200 feet of Quaternary alluvium (primarily sand and gravel) from tributaries of the Arkansas River. These deposits are underlain by Upper Cretaceous deposits of the Laramie and Fox Hills Formations that are part of the Denver Basin. The Laramie Formation (500 to 600 feet thick) is composed of sandstone and shale. The sandstone is fine to medium, friable, and carbonaceous. The Fox Hills Formation is comprised of sandstone and siltstone interbedded with shale. The sandstone in the Laramie and Fox Hills Formations yields water in a zone of up to 100 feet in thickness in the lower portions of the Laramie Formation and the upper portions of the Fox Hills Formation. Pierre Shale underlies the Laramie-Fox Hills Formation. Deposits of sand and gravel are common in El Paso County. However, most of these are unsuited for commercial use and are rated as poor for fill.

There are no major faults in the Colorado Springs vicinity; the nearest major faults are located about 80 to 100 miles from the area. The Sangro de Cristo Fault, with a characteristic magnitude (the expected magnitude of an earthquake based on fault geology and stress in the fault) of 7.5, is located about 80 miles southwest of the project area. The Sawatch Range Fault, with a characteristic magnitude of 7.2, is located about 90 miles southwest of the project area. The Cheraw Fault, with a characteristic magnitude of 7.1, is located about 100 miles southeast of the project area (USGS, 2000a). The project site is located in Zone 1 for potential earthquake damage, with slight damage anticipated from any seismic event (USAF, 1992), with expected magnitudes in the range of 4.0 to 4.4 on the Richter Scale (V to VI on the Modified Mercalli Scale). Earthquakes of this magnitude would typically cause breakage of windows or plaster or other slight damage. Since 1973, there have been 12 earthquakes within 100 kilometers (62 miles) of the site, with magnitudes ranging from 2.2 to 4.0 (USGS, 2003).

3.2.2 Soils

Soils in the project areas were formed in arkosic (derived from quartz- and feldspar-rich granite) sedimentary rocks derived from windblown and stream-deposited sediment. The project areas contain the Blakeland, Blendon, Ellicott, and Truckton soil series (see Figure 3.2-1). Properties of these soils are listed in Table 3.2-2. The Blakeland and Truckton soils occur on uplands on slight to moderate slopes, generally from 1 to 9 percent. The majority of Peterson AFB is located on Blakeland soils. Truckton soils occur in the northwestern part of the base near the East Fork of Sand Creek and in a small area of Peterson East. Blendon soils occur on alluvial fans and terraces in an area from the northwestern part of Peterson East to the southeastern part of the base. Slopes in these soils range from 0 to 3 percent. Ellicott soils occur in floodplains and terraces, with slopes from 0 to 5 percent, except for steeper slopes on stream banks. The only occurrence of Ellicott soils on Peterson AFB is in and near the floodplain of the East Fork of Sand Creek.

Table 3.2-2
Properties of Soils at Peterson AFB

Soil Property	Blakeland soil	Blendon soil	Ellicott soil	Truckton soil
Location	Upland	Alluvial fans and terraces	Terraces and floodplains	Upland
Permeability	Rapid (6-20 inches per hour)	Moderately rapid (2-6 inches per hour)	Rapid (6-20 inches per hour)	Moderately rapid (2-6 inches per hour)
Runoff	Slow	Slow	Slow	Slow to medium
Water erosion hazard	Moderate	Moderate	High	Moderate
Wind erosion hazard	Severe	Moderate	Moderate	Moderate to severe
Texture	0-11 inches: loamy sand	0-23 inches: sandy loam	0-4 inches: loamy coarse sand	0-8 inches: sandy loam
	11-27 inches: loamy sand	23-60 inches: fine sandy loam, sandy loam	4-60 inches: coarse sand to sandy loam	8-24 inches: sandy loam
	27-60 inches: sand			24-60 inches: sandy loam, loamy sand
Shrink-swell potential[1]	Low	Low	Low	Low
Excavation limits	Severe – cutbanks cave	Severe – cutbanks cave	Severe – cutbanks cave, flooding	Slight
Hydrologic Group[2]	A	B	A	B
Flooding	None	None	Frequent, brief, March-June	None
Depth to bedrock	Greater than 60 inches	Greater than 60 inches	Greater than 60 inches	Greater than 60 inches

[1] The shrink-swell potential is a measure of the volume change from dry to wet conditions. A low shrink-swell potential is a volume change of less than three percent.

[2] Hydrologic groups are based on runoff and infiltration characteristics. Group A soils have low runoff and high infiltration. Group B soils have moderate runoff and infiltration.

Source: USDA, 1981

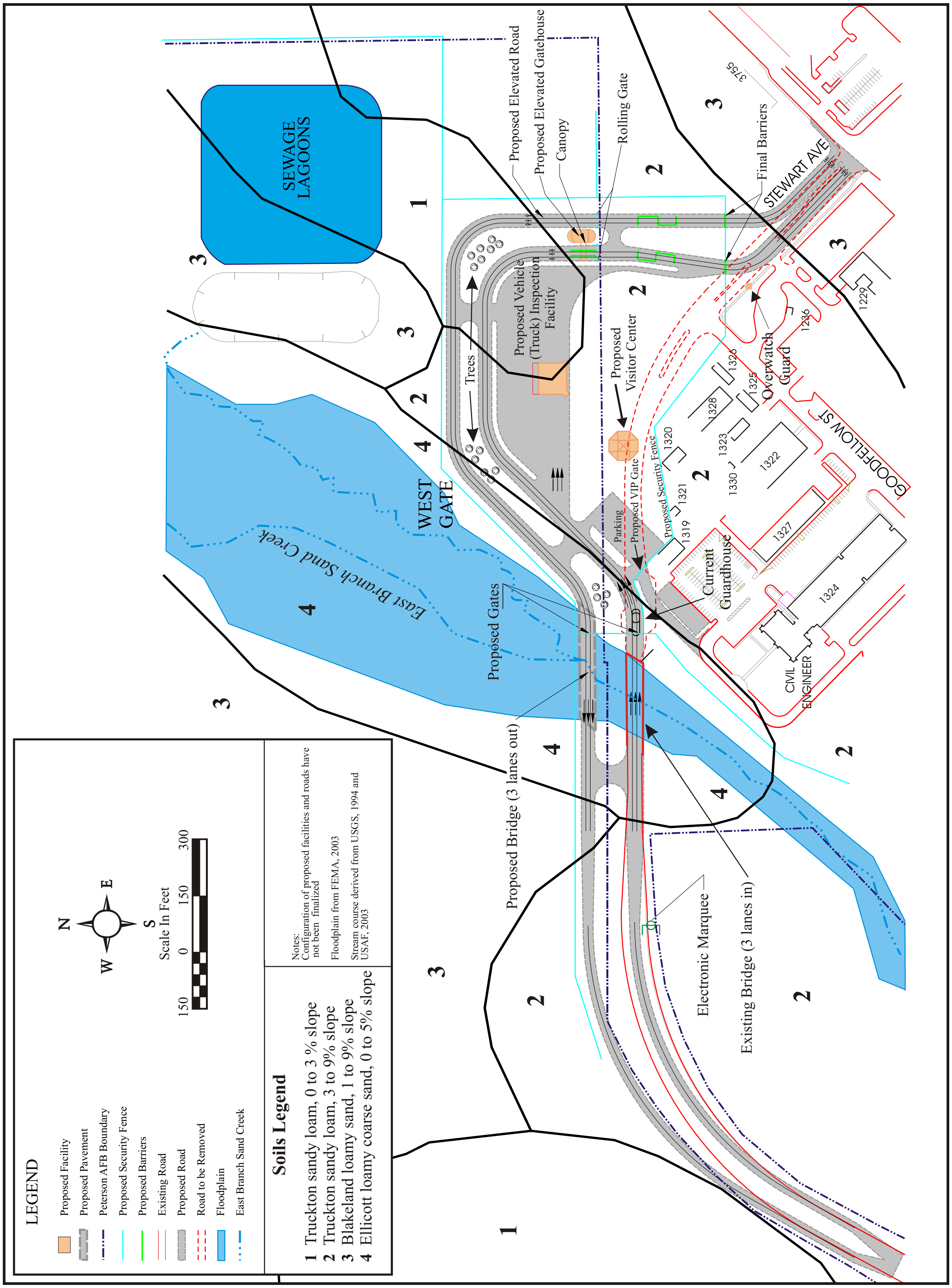

Figure 3.2-1. Soils in the Vicinity of Proposed West Gate Improvements

All of these soils are highly to very highly erodible when vegetative cover is disturbed. The Blakeland, Blendon, and Ellicott soils have severe limitations for excavations due to the high potential for excavations to cave in. Piping, a phenomenon where erosion causes subsurface tunnels in the soil and subsequent subsidence, occurs in all of the soils when it is disturbed. The potential for piping can be reduced by properly compacting the soil during site preparation and final grading (USDA, 1981). The Blakeland and Ellicott soils are somewhat excessively drained. Water removal from these soils is rapid, with a high saturated hydraulic conductivity (the rate of water movement within the soil). The Blendon and Truckton soils are well drained; water is removed from the soil readily, but not rapidly. None of the soils are hydric (NRCS, 1995) (hydric soils are one of the three indicators of wetlands, along with hydrology and vegetation). The Ellicott soils experience brief, frequent flooding from March to June. The Blendon and Truckton soils are subject to frost action (expansion and contraction of moisture within the soil from changes in soil temperatures above and below the freezing point of water). Frost action changes the volume of soil and can potentially damage structures and roads. The Blendon soil has low load-bearing strength.

As discussed above in Section 3.1.3, El Paso County requires a grading permit for fugitive particulate emissions and waterborne sediments from disturbed ground of more than one acre in size. The permit includes requirements to limit fugitive dust through best management practices, outlined in the El Paso County Land Development Code (Section 51). Erosion control requirements are discussed in Section 3.1.3. Additionally, if a proposed project is anticipated to disturbed 25 acres or more for six months or longer, a Colorado APEN is also required. Erosion control measures related to wind erosion and fugitive dust are discussed in Section 3.1.3. Measures to control water erosion (vegetative controls such as maintaining as much vegetation as possible, and structural controls such as sediment traps and basins and ground cover) are also included within permit requirements.

The El Paso County Land Development Code also requires a final site plan for stabilizing steep slopes and limiting storm water runoff from completed construction. Additional requirements for runoff and sediment discharge are discussed in Section 3.3.2.

Part of the land where Stewart Avenue would be realigned would be purchased from the Cherokee Sanitation District (see Figure 2.1-2). Near the northern border of this area, the Cherokee Sanitation District operated a sludge pit until 1985, where sludge from the sewage evaporation ponds was placed. The sludge pit was lined with bentonite clay to inhibit leaching of contents through the soil to groundwater. An area near the sludge pit has been used by the Cherokee Sanitation District for stockpiling of construction debris from waterline breaks and minor construction projects. The debris pile is about 300 feet by 125 feet and about 5 feet high. The debris consists of organic earthen fill, asphalt, concrete, and various piping scraps.

Soil sampling was conducted in September 2002 and August 2003 near the sludge pit and debris pile for target analyte metals, target compound list volatile compounds, target compound list semivolatile compounds, target compound list pesticides (but not PCB Aroclors), and petroleum products (diesel range organics) (USAF, 2003b). Regulatory limits for metals in soils have not been established, except for sites designated for cleanup (i.e., Superfund sites), or for lead contamination in residential areas. The CDPHE Division of Hazardous Materials and Waste Management has established soil cleanup guidelines for 11 volatile organic compounds, 3 semivolatile compounds, 2 pesticides and PCBs, and 6 metals (arsenic, cadmium, chromium, copper, lead, and mercury) for residential, commercial, and industrial land uses. Sampling results for volatile and semivolatile compounds, pesticides, and petroleum products did not detect anything at a level requiring remediation (USAF, 2003b). Sampling for target analyte metals detected arsenic above the CDPHE soil cleanup guidelines, ranging from 1 to 11 milligrams per kilogram (mg/kg). The sampling depths ranged from 0 to 45.5 feet. These guidelines, though useful as a rough comparison of levels of contamination, do not directly apply to this area. This area would be used as a roadway for vehicles entering the base and would not be used for residential, commercial, or industrial land uses. These levels of arsenic detected were within the normal range for background values (3 to 22 mg/kg) along the Front Range (Smith, 2004). Soil sampling conducted near the debris pile did not detect asbestos (USAF, 2003b). Testing was not conducted for PCBs.

3.3 WATER RESOURCES

Water resources include surface and groundwater sources, quantity, and quality. The hydrologic cycle results in the transport of water into various media such as the air, the ground surface, and subsurface. Natural and human-induced factors determine the quality of water resources. Water resources discussed in this section include groundwater, surface water (including storm water runoff), and floodplains.

3.3.1 Groundwater

Colorado Springs lies on the southern edge of the Denver Basin Aquifer System. The aquifer system underlies an area of about 7,000 square miles that extends from Greeley south to near Colorado Springs and from the Front Range east to near Limon. This system is comprised of four aquifers (Dawson, Denver, Arapahoe, and Laramie-Fox Hills) in five geologic formations and is up to 3,000 feet thick. At the outer edge of the system lies the Laramie-Fox Hills Aquifer, which underlies most of the project area (the only exception is the southern half of the proposed Stewart Avenue widening on Peterson East). The southern boundary of the Arapahoe Aquifer is about 2,000 feet north of the North Gate (about 1,000 feet north of the proposed site for the access road). The Denver Aquifer is about two miles north of the North Gate and proposed northeast gate project areas and the Dawson Aquifer is about six miles to the north (USGS, 1984).

The Laramie-Fox Hills Aquifer varies between 50 and 100 feet in thickness and ranges between 600 and 700 feet deep along the northern edge of Peterson AFB (USGS, 1984). Water yields in the Laramie-Fox Hills Aquifer are low, and therefore have not been used extensively as water supplies (USAF, 1989). Water taken from some areas of the Laramie-Fox Hills aquifer can be of marginal value due to oxygen deficient conditions which give rise to hydrogen sulfide and methane gases (USGS, 2000b). The Denver Basin is recharged principally by the downward percolation of less than one percent of the area's precipitation (USGS, 2000b). Hydraulic conductivity in the Laramie-Fox Hills Aquifer ranges from more than 6 feet per day near Littleton, Colorado to less than 0.5 feet per day on the northwest margin of the aquifer (USGS, 1984). Horizontal hydraulic conductivity near the project area is less than 0.5 feet per day, with groundwater flow toward the north-northeast (USAF, 1989). Several water wells are located within 1,000 feet of the West Gate, between Stewart Avenue and Platte Avenue, and north of the base.

The area's principal unconfined aquifer is in the alluvial sediments of the Fountain Creek Valley. This shallow aquifer ranges in depth from 0.8 feet to more than 100 feet (USGS, 1995). This aquifer is hydraulically isolated from the Denver Basin aquifer system. The perennially saturated portion of the aquifer does not lie directly underneath the project area. Depth to groundwater in the project area ranges from 12 feet near the East Branch of Sand Creek to about 100 feet (USAF, 1999a). The depth of the water table varies about two feet throughout the year (USGS, 1995). Groundwater in this aquifer flows to the southwest towards Fountain Creek. Hydraulic conductivity is about 800 feet per day in saturated parts of the alluvial aquifer (USAF, 1989). Perennially saturated portions of this alluvial aquifer near Fountain Creek supply the City of Colorado Springs with some of their drinking water.

Groundwater was sampled near the abovementioned sludge pit and construction debris pile near the West Gate (see Section 3.2.2). Filtered groundwater samples taken in September 2002 indicated chromium, copper, and lead above maximum contaminant levels (MCL) for primary drinking water standards (USAF, 2003b). Further sampling in August 2003 did not detect any pollutant above MCLs. Sampling for volatile and semivolatile compounds, and pesticides detected levels below MCLs.

3.3.2 Surface Water

The project area lies within the Fountain Creek Watershed (USGS hydrologic unit catalog 11020003), which drains into the Arkansas River (located about 35 miles to the south of the project area). The proposed upgrades at the West Gate include constructing a new bridge over the East Branch of Sand Creek. Proposed upgrades at the North gate are within 600 feet of the East Branch of Sand Creek. All other areas potentially impacted by the Proposed Action are between 2,500 and 8,500 feet from the nearest stream. The widening of Stewart Avenue would potentially impact an area about 2,500 feet north of an intermittent tributary of Jimmy Camp Creek. All other impacted areas are more than one mile from Jimmy Camp Creek. Jimmy Camp Creek and the East Branch of Sand Creek meet all water quality standards (USEPA, 2003a).

The area potentially impacted by realigning Stewart Avenue and Mitchell Street is about 1,400 north of Golf Course Pond number 1. All of the other potentially impacted areas are more than 3,000 feet from any of the detention ponds.

Storm water drainage on the main base drains into a series of inlets and buried lines. Storm water runoff from the north part of the base (Command Area and along Paine Street) flows out of an outfall at East Branch Sand Creek near the West Gate. This outfall is located about 30 feet north of the existing bridge over East Branch Sand Creek. Storm water runoff from the North Gate vicinity flows into a localized area of inlets and infiltrates into the ground. The areas where Paine Street would be extended to Stewart Avenue and the proposed access road for the proposed Northeast Gate have no existing storm water drainage. Storm water in the area where Stewart Avenue and Mitchell Street would be realigned flows to an outfall at Golf Course Pond 3. Storm water along Stewart Avenue from northeast of Mitchell Street to

Peterson East infiltrates into the ground alongside the road. The East Gate currently has a localized series of inlets which infiltrate into the ground nearby. A storm water drainage study is currently underway for Peterson East to provide a comprehensive plan for accommodating storm water runoff. Infiltration into soils and the underlying sediments is generally rapid in the Blakeland soils covering most of Peterson East and moderately rapid in the Blendon soils in the northern part of Peterson East. However, clay lenses occur in localized areas at a depth of 5 feet along Stewart Avenue north of the East Gate and sandy clay and clay lenses occur along Stewart Avenue south of the East Gate from 0 to 8 feet. These sandy clay and clay lenses inhibit the permeability and infiltration of water. Localized ponding occurs in many areas of Peterson East.

The Peterson AFB Storm Water Pollution Prevention Plan (SWPPP) requires that any construction activities at the base be performed under a separate National Pollutant Discharge Elimination System (NPDES) permit where applicable under 33 U.S.C. 26 Sec. 1342 (USAF, 2001). This regulation also contains provisions that mandate runoff and sediment discharge temporary controls during construction and completed permanent structures to control storm water runoff from the site. Controls on discharging waste which could impact water quality are also required. El Paso County requires a grading permit for proposed projects disturbing more than one acre. The permit includes requirements to develop an Erosion Control Plan for sediment control through best management practices outlined in the El Paso County Land Development Code (Section 51). This includes temporary structural and vegetative erosion controls (such as sediment traps or basins and maintaining vegetation to the extent possible) and a final site plan with permanent structures to limit runoff. Measures to control erosion must conform with the El Paso County Drainage Criteria Manual.

The East Branch of Sand Creek is considered waters of the U.S., and is subject to regulatory authority under the Clean Water Act. Waters of the U.S. are under the jurisdiction of the USACE under Section 404 of the *Clean Water Act* and include both deep water aquatic habitats and special aquatic sites, including wetlands. Under Section 404 of the *Clean Water Act*, a permit is required for placement of fill material in waters of the U.S. The USACE has the authority to approve nationwide permits for activities affecting waters of the U.S. Nationwide Permit (NWP) 13 pertains to bank stabilization for projects not exceeding 500 feet in length and NWP 14 pertains to construction of linear transportation projects such as fill or support piers for bridges, in waters of the U.S. NWP 33 regulates temporary fill or cofferdams for dewatering during construction. Section 401 water quality certification would be needed as part of the nationwide permit application. The project must be designed and constructed to avoid and minimize adverse effects to waters of the U.S. to the maximum extent practicable at the project site (i.e., on site).

3.3.3 Floodplains

Peterson AFB includes 3½ acres that are situated within the Federally-delineated 100-year floodplain for the East Fork of Sand Creek, in the northwest corner of the base. Figure 2.1-2 illustrates the 100-year floodplain, as delineated by the Federal Emergency Management Agency (FEMA). All of the floodplain in the vicinity of the West Gate has been designated as Zone AE, for which the base flood elevations have been determined (FEMA, 1997). The creek sustains year-round flow from the Cherokee Water and Sanitation District sewage lagoons. During heavy summer rains, the area can become flooded (USAF, 1996).

General Condition 26 of the nationwide permits requires the permittee to construct the activity in accordance with FEMA or FEMA-approved local floodplain construction requirements to minimize adverse effects to flood flows in 100-year floodplains. The Pikes Peak Regional Floodplain Administration enforces FEMA regulations through investigation and notification to correct violations, public education, evaluation of construction plans to determine if the property is located within a floodplain, and review of applications for Floodplain Development Permits. The permit is required for new construction, alteration to an existing structure and/or modification to property within a floodplain, including designated zones A, AO, AE and AH.

The need for a County permit depends upon the degree of impact to the floodplain from the bridge. The county permit criteria is zero rise in the floodplain height or width. If the bridge design is such that the floodplain would rise in elevation or increase in width, a Conditional Letter of Map Revision for the FEMA floodplain map would be required.

Potential development in the floodplain is subject to the provisions of Executive Order 11988, *Floodplain Management*, which requires Federal agencies to look at all practical alternatives to avoid impacts to floodplains. AFI 32-7064, *Integrated Natural Resources Management*, lists three criteria that must be met for the USAF to construct in a floodplain: evaluate and document the potential effects of such actions through the environmental impact analysis process; consider alternatives to avoid these effects and incompatible development in the floodplain; and design or modify actions in order to minimize potential harm to or within the floodplain.

3.4 BIOLOGICAL RESOURCES

Biological resources include the native and introduced plants and animals that make up natural communities. The natural communities are closely linked to the climate and topography of the area. Biological resources discussed below include vegetation, wildlife, threatened or endangered species, and wetlands.

3.4.1 Vegetation

Peterson AFB lies along the western edge of the Great Plains and along the eastern foothills of the Rocky Mountains. The majority of lands on Peterson AFB have been impacted by construction activities (e.g., excavation, grading, and bulldozing) and landscaping practices. These activities have permanently altered the native habitats on base.

Most of Peterson AFB consists of a mosaic of highly managed traditional turf, shrub and tree landscaping, interspersed with lower maintenance areas featuring swathes of rock mulch or xeric grasses and native forbs. Broad stands of bluegrass lawn are maintained along principal streets and boulevards, and around living quarters. Ponderosa and Austrian pine, green ash, Russian olive, Siberian elm and other common horticultural species and varieties are planted to create a park-like environment; numerous species and varieties of shrubs are utilized for building foundation treatments. Of the 1,278 acres on Peterson

AFB, 903 acres are improved grounds (landscaped, irrigated, and intensively mowed), 369 acres are semi-improved (planted with native grasses, mowed, and weeds are suppressed), and 6 acres are aquatic. There are no unimproved lands. The 16.5 acres recently purchased near the North Gate is semi-improved land.

The natural vegetation of Peterson AFB, which exists only on portions of Peterson East, is comprised of mid- to tallgrass prairie within a life zone largely dominated by shortgrass plains. Tallgrass prairie remnants are difficult to distinguish due to the mowing regime practiced to one extent or another over the entire base (USAF, 2003c). A small remnant area (less than one acre) of imperiled northern sandhill prairie community consisting of big bluestem (*Andropogen gerardii*) and prairie sandreed (*Calamovilfa longifolia*) with related forbs was documented on Peterson East in a 1996 survey by the Colorado Natural Heritage Program (CNHP, 1997). Another occurrence of this community, comprising four acres was documented on Colorado Springs Airport property to the south of Peterson East. The occurrence of this community on Peterson East was ranked as questionable viability which could only be restored with great effort. Needle-and-thread (*Hesperostipa comata*) appears to be the dominant grass at Peterson East and the rough at the golf course. Buffalo grass (*Buchloe dactyloides*) and to a lesser extent blue grama (*Chondrosum gracile*) are present at Peterson East and on the main part of the base, the former especially planted in areas for low maintenance. Six-weeks fescue (*Vulpia octoflora*), Western wheatgrass (*Pascopyrum smithii*) and indian ricegrass (*Achnatherum hymenoides*) can also be found locally. Prickly pear and brittle cacti (*Opuntia polyacantha* and *O. fragilis*, respectively) are common subshrubs at Peterson East and infrequent elsewhere on base, while suppressed yucca (*Yucca glauca*) and fringed sage (*Artemisia frigida*) can also occasionally be found on Peterson East. A number of forbs are virtually ubiquitous both at Peterson East and at less-intensively managed locations within the developed portion of the base. These include golden aster (*Heterotheca villosa*), sand verbena (*Abronia fragrans*), spiderwort (*Tradescantia occidentalis*), several penstemons (*Penstemon* spp.), the non-weedy native plains and Flodman's thistles (*Cirsium canescens* and *C. flodmanii*, respectively), daisy (*Erigeron* sp.), and cryptantha (*Oreocarya* sp.).

The Air Force conducted a noxious weed survey of the base in the spring of 2003. Eleven species of weeds were mapped at or near the base, three of which are included among the top ten prioritized weed species listed in the *Colorado Noxious Weed Act*, and all but one of the rest listed on the State Noxious Weed List. Most of the occurrences of noxious weeds found on Peterson AFB involve low cover and/or very small numbers of shoots. Current management of noxious weeds on base by grounds maintenance personnel involves timely mowing, spraying, and pulling of weeds by hand. The most numerous occurrences of field bindweed were found to the west of the North Gate, with lesser amounts near the West Gate. Canada thistle also occurs near the North and West Gates. Other noxious weed occurrences are in areas not impacted by the Proposed Action.

3.4.2 Wildlife

The main built-up portion of Peterson AFB provides limited quality habitat for wildlife. The fauna of the base and surrounding area is a mixture typical of both the foothills of the Southern Rocky Mountains and the western edge of the high plains. Pronghorn

(*Antilocapra americana*), mule deer (*Odocoileus hemionus*) and coyote (*Canis latrans*) can be found nearby, and red fox (*Vulpes vulpes*) actually live on the Silver Spruce Golf Course (USAF, 2003c). Eastern cottontail (*Sylvilagus floridanus*) is present extensively in base housing, while black-tailed prairie dog (*Cynomys ludovicianus*), plains pocket gopher (*Geomys bursarius*), Ord's kangaroo rat (*Dipodomys ordi*), prairie and meadow voles (*Microtus ochrogaster* and *M. pennsylvanicus*, respectively) and deer mice (*Peromyscus spp*.) are present at least in neighboring grassland (USAF, 2003c). Birds common to the plains seen on base include western meadowlark (*Sturnella neglecta*), horned lark (*Eremophila alpestris*), Swainson's hawk (*Buteo swainsoni*) and American kestrel (*Falco sparverius*).

Cliff swallows (*Hirundo pyrrhonota*) typically nest in colonies on buildings and bridges and have been observed nesting on the bridge over the East Branch of Sand Creek. Swallows capture hundreds of insects, including flying ants, termites, aphids, mosquitoes, crane flies and moths. On average, insects make up 99.8 percent of the swallow's diet. They are migratory birds, wintering as far south as Central and South America, and arriving in western United States in late February to March. They return to Colorado and other northern states and provinces in spring – in Colorado it can be as early as February or as late as June, depending on the weather (CDNR, 2004). In the Colorado Springs area, swallows normally return in April and begin nesting (Mann, 2004). As nest building is completed, egg laying begins (usually in April). The nesting season extends from April through September, when the swallows migrate south for the winter (Gorenzel and Salmon, 1994). Swallows are tolerant of human activity, including noise. Swallows, their active nests and eggs are all protected by the Federal *Migratory Bird Treaty Act* of 1918 and may not be destroyed. The U.S. Fish and Wildlife Service (USFWS) allows vacant nests to be destroyed, but nests with active birds, their young or the presence of eggs must be left alone, under the protection of Federal law. Cliff swallows are also protected as a non-game bird in Colorado (*Code of Colorado Regulations*, Chapter 10, Articles I and IV).

3.4.3 Threatened or Endangered Species

The *Endangered Species Act* requires that any action authorized by a Federal agency shall not jeopardize the continued existence of a threatened or endangered species, or result in the destruction or modification of designated critical habitat of such species. A listed species provided protection under the *Endangered Species Act* is so designated because of danger of its extinction as a consequence of economic growth and development without adequate concern and conservation.

According to the USFWS, there are ten Federally-listed species which are either present in El Paso County, or the County is within the historical range of these species (see Table 3.4-1). However, no state or Federal classified threatened or endangered species were identified on base during the 1996 CNHP biological inventory (CNHP, 1997). There are no known threatened or endangered species in the project area. The Preble's meadow jumping mouse (*Zapus hudsonius preblei*), listed by the USFWS as a threatened species, occurs along the Front Range in Colorado. Its geographic range is riparian areas below 7,600 feet (2,300 meters) as far south as north central El Paso County (Federal Register,

Table 3.4-1 Federally Listed Species in El Paso County		
Common Name	**Scientific Name**	**Federal Status**
Bald eagle	*Haliaeetus leucocephalus*	Listed Threatened
Mexican spotted owl	*Strix occidentalis lucida*	Listed Threatened
Black-footed ferret	*Mustela nigripes*	Listed Endangered
Black-tailed prairie dog	*Cynomys ludovicianus*	Candidate for Listing
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	Listed Threatened
Arkansas darter	*Etheostoma cragini*	Candidate for Listing
Greenback cutthroat trout	*Oncorhynchus clarki stomias*	Listed Threatened
Colorado butterfly plant	*Gaura neomexicana* ssp. *coloradensis*	Listed Threatened
Slender moonwort	*Botrychium lineare*	Candidate for Listing
Ute ladies'-tresses	*Spiranthes diluvialis*	Listed Threatened

Source: USFWS, 2004

Note: None of these species were identified on Peterson AFB during the 1996 Colorado Natural Heritage Program biological inventory (CNHP, 1997)

2003). Areas within 300 feet of creeks are considered potential habitat of the Preble's mouse. Eight areas along the Front Range were designated as critical habitat for the Preble's mouse (Federal Register, 2003). The East Branch of Sand Creek was not designated as critical habitat for the Preble's mouse and the area that would be disturbed near the East Branch of Sand Creek is not considered habitat for the Preble's meadow jumping mouse. Trapping studies upstream and downstream of the site have yielded negative trapping results for the Preble's mouse (USFWS, 2004a). Listing of the Preble's meadow jumping mouse as threatened is currently undergoing a 12-month status review, scheduled to be completed in July 2005 (Federal Register, 2004).

An area just west of the North Gate being considered for a proposed new entry road to the gate (see Figure 2.1-3 and Section 2.1.1) is within 280 feet of the floodplain of the East Branch of Sand Creek. Most of the area between Peterson AFB and the floodplain was heavily modified during construction of U.S. Highway 24. This area is not considered habitat for the Preble's mouse (USFWS, 2004a).

3.4.4 Wetlands

Wetlands are defined as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (USACE, 1987). Wetlands are diverse ecosystems that provide ecological benefits by supporting commercial fisheries, controlling floods, filtering wastes from water, and serving as recreation areas. They also provide habitat for many plant and animal species, including economically valuable waterfowl and one-third of the nation's endangered species.

Peterson AFB, in coordination with the United States Army Corps of Engineers (USACE), conducted a field survey to identify jurisdictional wetlands on base in May 1995 (USAF, 1996). The USACE determined that there are no legally defined wetlands on Peterson AFB. Golf Course Ponds Nos. 1, 2, and 3 were listed on the 1975 National Wetlands

Inventory Map; however, they are not considered wetlands because they were created on existing dryland with no naturally occurring wetland vegetation or hydric soils, and they are rubber-lined. The East Branch of Sand Creek, which crosses the northwest corner of the base, did not meet the USACE wetland criteria.

3.5 CULTURAL RESOURCES

Cultural resources are archaeological, historical, and Native American items, places, or events considered important to a culture, community, tradition, religion, or science. Archaeological and historic resources are locations where human activity measurably altered the earth or left deposits of physical or biological remains. Prehistoric examples include arrowheads, rock scatterings, and village remains, whereas historic resources generally include campsites, roads, fences, homesteads, trails, and battlegrounds. Architectural examples of historic resources include bridges, buildings, canals, and other structures of historic or aesthetic value. Native American resources can include tribal burial grounds, habitations, religious ceremonial areas or instruments, or anything considered essential for the persistence of their traditional culture.

Records on file at the Colorado Historical Society, Office of Archaeology and Historic Preservation and at Peterson AFB indicate 11 cultural resources projects have been conducted (either on Peterson AFB or surrounding Peterson AFB) within a mile of the base. Peterson AFB has been 100 percent surveyed for archaeological and historical resources. The surveys did not identify any cultural resources that were determined eligible or potentially eligible for inclusion in the National Register of Historic Places (USAF, 1998b). There are no historic buildings or Cold War properties on the project sites. The West Gate guard shack would be the only building demolished and it has no historical significance.

3.6 NOISE

Noise is defined as any unwanted sound that interferes with normal activities or in some way reduces the quality of the environment. Ambient noise levels vary greatly in magnitude and character from one location to another, depending on the normal activities conducted in the area. In general, noise levels around Air Force installations result primarily from aircraft operations at the base. Peterson AFB shares three runways with the Colorado Springs Municipal Airport.

3.6.1 Noise Descriptors

Community response to noise is not based on a single event, but on a series of events over the day. Factors that have been found to affect the subjective assessment of the daily noise environment include the noise levels of individual events, the number of events per day, and the time of day at which the events occur. Most environmental descriptors of noise are based on these three factors, although they may differ considerably in the manner in which the factors are taken into account. Three types of noise measures are used to describe impacts on an existing environment. These include the decibel, the equivalent sound level, and the day-night average sound level. These measures and their application to noise environments are discussed below.

A decibel (dB) is the physical unit commonly used to describe instantaneous sound levels. Sound measurement is further refined by using an "A-weighted" decibel (dBA) scale, which emphasizes the audio frequency response curve audible to the human ear. Thus, the dBA measurement more closely describes how a person perceives sound. Typical noise levels include: a quiet urban nighttime (40 dBA), an air conditioner operating 100 feet away (55 dBA), and a heavy truck moving 50 feet away (85 dBA). Table 3.6-1 shows noise levels for various human activities, while Table 3.6-2 provides approximate sound levels for various types of construction equipment.

Table 3.6-1
Typical Decibel Levels Encountered in the Environment and Industry

Sound Level (dBA)	***MEL[1]***	***Source of Noise***	***Subjective Impression***
10			Threshold of hearing
20		Still recording studio; Rustling leaves	
30		Quiet bedroom	
35		Soft whisper at 5 feet; Typical library	
40		Quiet urban setting (nighttime); Normal level in home	Threshold of quiet
45		Large transformer at 200 ft	
50		Private business office; Light traffic at 100 ft; Quiet urban setting (daytime)	
55		Window air conditioner; Men's clothing department in store	Desirable limit for outdoor residential area use (EPA)
60		Conversational speech; Data processing center	
65		Busy restaurant; Automobile at 100 ft	Acceptable level for residential land use
70		Vacuum cleaner in home; Freight train at 100 ft.	Threshold of moderately loud
75		Freeway at 10 ft	
80		Ringing alarm clock at 2 ft; Kitchen garbage disposal; Loud orchestral music in large room	Most residents annoyed
85		Printing press; Boiler room; Heavy truck at 50 ft	Threshold of hearing damage for prolonged exposure
90	8 hr	Heavy city traffic	
95	4 hr	Freight train at 50 ft; Home lawn mower	
100	2 hr	Pile driver at 50 ft; Heavy diesel equipment at 25 ft	Threshold of very loud
105	1 hr	Banging on steel plate; Air hammer	
110	0.5 hr	Rock music concert; Turbine condenser	
115	0.25 hr	Jet plane overhead at 500 ft	
120	< 0.25 hr	Jet plane taking off at 200 ft	Threshold of pain
135	< 0.25 hr	Civil defense siren at 100 ft	Threshold of extremely loud

MEL = maximum exposure limits

Source: U.S. Army, 1978

Construction equipment noise impacts to nearby receptors during a typical day is normally measured over a time period, using the equivalent sound level (L_{eq}). L_{eq} averaged over 8 hours is denoted by $L_{eq\ (8)}$ and is calculated using the dBA levels of noise events averaged over time, taking into account the usage factor of various types of equipment. There are two basic considerations for protecting the community from increased noise from short-term sources. To protect human health, noise levels must not exceed limits identified with potential loss of hearing. An L_{eq} of 75 dB sustained over 8 hours for 250 days or more per year can cause hearing loss to a general population over a prolonged time period (about 40 years) (WHO,1995; USEPA, 1974). The other consideration for protecting the public is noise interference with activity, or annoyance. The L_{eq} is normally averaged over 24 hours ($L_{eq\ (24)}$) to assess annoyance. The level of annoyance or interference depends upon the setting in which the increased noise takes place, for both indoor and outdoor activities. Thresholds for various uses vary from 45 $L_{eq\ (24)}$ within hospitals, educational facilities, residences, and other locations based on a quiet use to 55 $L_{eq\ (24)}$ for outdoor exposure in recreational, commercial, and industrial areas (USEPA, 1974). Communities that typically experience higher noise levels, tolerate higher increases in noise (typically 5 dB more without complaints).

Another descriptor of a noise environment over extended periods of hours or days, used primarily for estimating noise impacts from aircraft, is the day-night average sound level (L_{dn}). To compute an L_{dn}, single noise events are measured using an A-weighted scale with corrections added for the number of events and the time of day. A 10-dB penalty is added for noise that occurs between the hours of 10 p.m. and 7 a.m. because nighttime noise events are considered more annoying than noise occurring during daytime. The L_{dn} descriptor is accepted by federal agencies, including the Air Force, as a standard for estimating noise impact and establishing guidelines for compatible land uses. The L_{dn} is a measure of long-term noise environments.

Noise generated near the ground generally attenuates 6 dB for each doubling of distance from a noise source; trees and terrain would further increase attenuation. Noise generated further above ground (above 50 ft) generally attenuates about 2 dB for every doubling of distance.

Table 3.6-2
Approximate Sound Levels (dBA) of Construction Equipment

	Sound Levels (dBA) at Various Distances (ft)					
Averaging Time	**50**	**100**	**200**	**400**	**800**	**1,600**
8 hours	88.5	82.5	76.5	70.5	64.5	58.5
24 hours	82.0	76.0	70.0	64.0	58.0	52.0

Leq for 8 and 24 hours, using an average source of 90 dB at 50 feet from a typical mix of construction equipment, generating a maximum noise level 70 percent of an eight hour period. The 24-hour average is averaged over one year, assuming 250 workdays.

Noise attenuation of 6 dBA for each doubling of distance assumes flat terrain with no trees or buildings. Trees and buildings would increase the attenuation, reducing noise levels at various distances.

Assumes a background noise level of 55 dBA for a typical urban area (USEPA, 1974)

3.6.2 Existing Noise Conditions

Noise generated in the vicinity of Peterson AFB is from aircraft operating in and out of the Colorado Springs Airport, which results in greater noise impacts than ground traffic. The base shares the runways with the airport, which supports approximately 228,000 flights a year (FAA, 2004). The aircraft noises fall within a broad range of "transient" noises, which come and go in a finite period of time. Other sources of noise in the vicinity of Peterson AFB include vehicular traffic, construction, and equipment operation. Except for aircraft operations that cause noise levels in excess of 85 L_{dn}, other noise levels on Peterson AFB generally range less than 65 L_{dn}. The military family housing and community buildings (such as child care and chapel) are all located in areas with less than 65 L_{dn}, but are accustomed to noise from aircraft operations. Temporary noise impacts from construction equipment would not affect the long-term noise environment as measured with L_{dn} factors. Thus, L_{dn} will not be discussed as a measure of noise in Chapter 4.

3.6.3 Noise Sensitive Receptors

A noise sensitive receptor is commonly defined as the occupants of any facility where a state of quietness is a basis for use, such as a residence, hospital, or church. Noise sensitive receptors at Peterson AFB include the child development center (Building 1350), the auditorium (Building 1440), the youth center (Building 1555), the chapel (Building 1410), the child care center (Building 1525), the clinic (Building 959), and base housing. There are no noise sensitive receptors on Peterson East. Off-base noise sensitive receptors include a residential area about 0.3 miles west of Powers Boulevard and Stewart Avenue (one mile southwest of the West gate) and a residential area northwest of Peterson Boulevard and Highway 24 (about 0.5 miles northwest of the North Gate).

3.7 ENVIRONMENTAL JUSTICE

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was signed by the President on February 11, 1994. This EO requires that each Federal agency identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. In order to evaluate these potential effects, demographic data on minority populations and low-income populations are provided in this section.

The terms "low-income" and "minority" are defined according to guidance published by the Air Force Center for Environmental Excellence (AFCEE). Under this guidance, "low-income" is defined as persons below the poverty level. "Minority" means persons designated in census data as Black (African-American); American Indian, Eskimo, or Aleut (Native American); Asian or Pacific Islander (now two separate designations in the 2000 Census); Other; or of Hispanic origin (AFCEE, 1997). The 1997 AFCEE Guidance did not address the new census category, "Two or more Races;" for this analysis, that category is also considered as a minority. According to the United States Bureau of Census (USBC) definition (USBC, 2001), the Hispanic origin designation is separate from the ethnic (racial) designation, as "people who identify their origin as Spanish, Hispanic, or Latino may be of any race." An area within a one mile radius of the project sites was analyzed for environmental justice concerns, as this area would provide a conservative estimate of areas potentially impacted by increased noise, air pollutants, or other environmental impacts.

Environmental Justice also takes into consideration EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, which was signed by the President on

April 21, 1997. This EO requires that each Federal agency identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on children, who are more at risk because of developing body systems, comparatively higher consumption-to-weight ratios, behaviors that may expose them to more risks and hazards than adults, and less ability than adults to protect themselves from harm.

This section describes the minority and low-income characteristics of El Paso County. The descriptions are based on data from the 2000 *Census of Population and Housing*. Table 3.7-1 summarizes the proportions of ethnic, Hispanic, and low-income populations in El Paso County. The 2000 Census found that the population of El Paso County was 81 percent White. Notable other categories include Black or African-American (6.5 percent), and Asian (2.5 percent), while Other and Two or More Races accounted for 8.6 percent of the total. Hispanics comprise more than 11 percent of the El Paso County population.

Colorado proportions are somewhat similar, but with smaller proportions of Blacks and Asians, and 10 percent of the state's population identifying themselves as Other or Two or More Races. The State's Hispanic population accounts for more than 17 percent of the total. In contrast, the U.S. population is approximately 25 percent minority, with Hispanics (12.5 percent) as the largest minority group, and Blacks representing 12.3 percent of total population. Less than 10 percent of the El Paso County population was below the poverty level, while about 10 percent of the state's population and 13 percent of the U.S. population was in this category.

The area to the north of the North Gate is the most heavily populated of these areas, with a population of about 12,100 people within census tracts within one mile of the North Gate. Similar areas outside the West and East Gates have populations of about 1,200 and 25, respectively. Near the East Gate, no population resides within ½ mile. There are no residential areas within 0.7 miles of the West Gate and about 0.3 miles of the North Gate. Populations near the North and East Gates are comparable to county and state averages (see Table 3.7-1). The number of blacks and those of two races are somewhat higher than county and state averages west of the West Gate (USBC, 2002; USBC, 2001).

Table 3.7-1
Census 2000 Characteristics:
Population Segment as a Percentage of the Total Population, Proposed Sites

	East Gate	West Gate	North Gate	El Paso County	CO
White	87.5%	70.8%	79.2%	81.2%	82.8%
Black or African American	0.0%	11.4%	7.3%	6.5%	3.8%
American Indian and Alaska Native	0.0%	1.3%	0.8%	0.9%	1.0%
Asian	0.0%	1.6%	2.4%	2.5%	2.2%
Native Hawaiian and Other Pacific Islander	0.0%	0.6%	0.3%	0.2%	0.1%
Some other race	4.2%	7.1%	5.0%	4.7%	7.2%
Two or more races	8.3%	7.3%	4.9%	3.9%	2.8%
Hispanic Origin (can be any race)	8.3%	9.4%	12.5%	11.3%	17.1%
Children (age 17 or less)	29.2%	28.2%	31.0%	27.6%	25.6%
Below poverty level[2]	4.5%	11.1%	8.6%	8.0%	9.3%

[1] Census blocks off-base within 2 miles of the proposed site.
[2] Values for the percent of persons below poverty level are from Census 2000 Summary File 3.
Sources: USBC, 2002; USBC, 2001.

3.8 TRANSPORTATION

Transportation systems facilitate the movement of people, goods, and materials on the ground, on water, or through the air. For transportation systems to be adequate, users must be able to reach their destination within reasonable limits of time, cost, and convenience. Traffic volumes on major roads and the LOS was used to characterize the transportation system at and in the vicinity of Peterson AFB. Construction and operational activities addressed in this EA would impact only ground transportation.

3.8.1 Level of Service

Several measures are used to determine the efficiency of traffic flow. Performance of a roadway segment may be expressed in terms of LOS—a qualitative measure of operational factors such as speed, travel delay, freedom to maneuver, safety, and time (frequency or hours) of operation. The LOS may be derived by characterizing traffic flow as a percent of roadway capacity on freeways or arterials or as delays per vehicle for signalized intersections (see Table 3.8-1) (TRB, 1985). Roadway capacity depends mainly on the street width, number of travel lanes, intersection controls, and other physical factors. The LOS scale ranges from A to F, with A being the best (representing free flow conditions), and LOS of F representing unstable flow (where volume exceeds the capacity of the road). Generally, LOS A, B, and C represent acceptable traffic flow. Another measure of traffic flow is the volume to capacity ratio, expressed as a number, where 1.00 indicates flow is equal to capacity. A number greater than 1.00 indicates flow exceeding capacity and a number less than 1.00 indicates flow less than capacity. In relation to LOS, traffic flow at the capacity of a road segment is considered LOS E.

Table 3.8-1
LOS for Freeways, Multi-lane Highways, and Signalized Intersections

Freeway			*Multi-lane Highways*			*Signalized Intersections*	
Level of Service	*Volume/ capacity*[1]	*MSF*[1,2]	*Level of Service*	*Volume/capacity*[1]	*MSF*[2,3]	*Level of Service*	*Stopped Delay per Vehicle*[4]
A	< 0.32	—	A	< 0.31	660	A	≤ 5.0 seconds
B	0.33-0.48	1,000	B	0.32-0.51	1,100	B	5.1 to 15.0 seconds
C	0.49 – 0.68	1,400	C	0.52 – 0.71	1,510	C	15.1 to 25.0 seconds
D	0.69 – 0.83	1,700	D	0.72 – 0.85	1,800	D	25.1 to 40.0 seconds
E	0.84 – 1.00	2,000	E	0.86 – 1.00	2,100	E	40.1 to 60.0 seconds
F	>1.00	[5]	F	>1.00	[5]	F	> 60.0 seconds

[1] Based on a 60 mph design speed
[2] Maximum per lane service flow rate in passenger cars per hour per lane
[3] Based on a 55 mph design speed
[4] Average stopped delay for all vehicles passing through the intersection in a 15-minute period
[5] Highly variable due to instability
Source: TRB, 1985

3.8.2 Existing Traffic Conditions

Peterson AFB can be accessed by the North Gate via Peterson Boulevard, by the West Gate via Stewart Avenue, and by the East Gate from Marksheffel Road. Peterson Boulevard is accessible by U.S. Highway 24 or Peterson Road to the north of the base. An alternate route is Space Village Avenue from Highway 94 to Peterson Boulevard. Stewart Avenue is accessible by Powers Boulevard and Airport Road to the west. Marksheffel Road is accessible from Highway 94 from the north or Drennan Road and Bradley Road from the south and east. The streets are shown in Figure 1.1-1.

Roadways in the vicinity of the base that are used to access Peterson AFB include the following:

- U.S. Highway 24, a four-lane divided highway (urban freeway) with on and off ramps north of the Main Gate.
- Space Village Road, a two-lane minor collector from Highway 94 east of Marksheffel Road to Peterson Boulevard.
- Peterson Boulevard, a four-lane arterial connecting the Main Gate with the central portion of the base. The intersection of Peterson Boulevard and Stewart Avenue is signalized and has left turn lanes for all four directions. This road extends off-base north of Highway 24 as Peterson Road, a four-lane minor arterial.
- U.S. Highway 24, a six lane highway (urban freeway) with on and off ramps west of the West Gate.
- Stewart Avenue, an arterial connecting the West Gate to Peterson Boulevard (Stewart Avenue is two lane coming into the base and four lane east of the West Gate to its intersection with Mitchell Avenue.
- Marksheffel Road, a two-lane principal arterial that runs from Colorado Highway 94 to county road 217 and 477, about 7 miles south of Peterson AFB.

The Main and West gates operate at LOS F during morning and afternoon peak hours, with traffic flow exceeding capacity. The Main Gate handles more traffic at an average of 19,770 vehicles per weekday (1,800 vehicles during the peak morning hour) compared to the West Gate's 10,490 vehicles per weekday (1,081 vehicles during the peak morning hour) (USAF, 1999b). The East Gate handles an average of 700 vehicles per week and operates at an LOS of A or B. The East Gate is only open during peak hours. Table 3.8-2 shows the traffic volumes at Peterson AFB gates, and LOS for intersections in the vicinity of the existing BX and commissary, as available.

The LOS for U.S. Highway 24 is A or B along segments in the vicinity of Peterson AFB, with traffic flows between 33 and 40 percent of capacity. The LOS for Peterson Road north of the base is B, with a peak-hour traffic flow at about 65 percent of capacity. The peak-hour traffic flow on Space Village Avenue north of the base near Peterson Boulevard is about 46 percent of capacity during peak hours (USAF, 1999b). Traffic on Marksheffel Road is about 13 percent of capacity in peak hours (LOS A).

Table 3.8-2
Existing Traffic Flow at Peterson AFB

Location	*AWT*[1]	*AM*		*PM*	
		VC Ratio	*LOS*[2]	*VC Ratio*	*LOS*
Peterson Blvd/North Gate	19,770	1.13	F	1.03	F
Stewart Avenue/West Gate	10,490	1.35	F	1.12	F
Marksheffel Road/East Gate	700	0.40	B	0.02	A

Existing LOS for Major Intersections at Peterson AFB, CO

Intersection	AM Peak Hour LOS	PM Peak Hour LOS
Peterson Blvd/Paine St	C	C
Stewart Avenue/Paine St	A[3]	D[4]
Stewart Avenue/Peterson Blvd	B	C
Peterson Blvd/South Ramps US 24	B	C
Peterson Blvd/North Ramps US 24	B	B

[1] Average weekday traffic.
[2] Level of Service (see Table 3.8-1)
[3] The LOS is D for left (northbound) turns from Stewart Avenue onto Paine Street during the a.m. peak hour.
[4] The LOS is F for left (northbound) turns from Stewart Avenue onto Paine Street during the p.m. peak hour.
Source: CDOT, 2002; USAF, 1999b

On average, 3,100 vehicles per day travel on Stewart Avenue north of the East Gate. Traffic flow at the intersection of Stewart Avenue and Mitchell Street is estimated at LOS A for the morning and evening peak hours, with about 565 passing through the intersection in the morning rush and about 545 vehicles passing through the intersection during the evening rush (USAF, 1995).

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CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

4. ENVIRONMENTAL CONSEQUENCES

This chapter discusses the potential for significant impacts to the human environment as a result of implementing the Proposed Action, West Gate Alternative, Northeast Gate Alternatives, or the No Action Alternative. As defined in 40 CFR Section 1508.14, the human environment is interpreted to include natural and physical resources, and the relationship of people with those resources. Accordingly, this analysis has focused on identifying types of impacts and estimating their potential significance. This chapter discusses the effects that the Proposed Action or Alternatives could generate at Peterson AFB and adjacent lands in the environmental resource areas described in Chapter 3.

The concept of "significance" used in this assessment includes consideration of both the context and the intensity or severity of the impact, as defined by 40 CFR 1508.27. Severity of an impact could be based on the magnitude of change, the likelihood of change, the potential for violation of laws or regulations, the context of the impact (both spatial and temporal), and the resilience of the resource. Significant impacts are effects that are most substantial and should receive the greatest attention in decision making. Impacts that are not significant include those that result in little or no effect to the existing environment or that cannot be easily detected. If a resource would not be affected by a proposed activity, a finding of no impact was declared.

When potential environmental issues are identified, the magnitude of these impacts can be reduced through mitigation or best management practices. Best management practices are those measures which are incorporated into standard procedures during construction and upon completion of a project. Best management practices include actions which are part of permitting requirements, such as the use of sediment traps for erosion control, or watering for dust suppression. The CEQ regulations (40 CFR 1508.20) define mitigations as avoiding the impact altogether by not taking a certain action or parts of an action; minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or compensating for the impact by replacing or providing substitute resources or environments. In accordance with 32 CFR 989, mitigations are specific measures approved during the NEPA process and included in the FONSI which require monitoring for compliance and funding to implement.

This chapter is organized by resource element in the same order as introduced in Chapter 3. The chapter provides a discussion of the analysis methods and the potential impacts of the Proposed Action and Alternatives. Best management practices are included in the potential impacts section of each resource area. A mitigation measures section is included for each resource area; no mitigation measures requiring monitoring for compliance were identified. The chapter concludes with an evaluation of the relationships between short-term uses of the environment and long-term productivity, cumulative impacts, and irreversible and irretrievable commitments of resources.

4.1 AIR RESOURCES

The Proposed Action would have short-term, but not significant, impacts on air quality generated by construction of security upgrades at the gates, road improvements, and from operation of the facilities. An El Paso County grading permit would be required for each of the Proposed Actions. A Colorado APEN for PM_{10} emissions to complete earth removal and grading would not be required for proposed improvements at the East Gate. An APEN would likely be required for PM_{10} emissions for proposed construction of facilities at the West Gate and improvements to Stewart Avenue, and extending Paine Street because these projects would likely occur concurrently, total more than 25 acres, and disturb land for more than six months. The potential need for an APEN for the remaining projects not yet programmed (North and Northeast Gates, realigning Stewart Avenue and Mitchell Street, and widening Stewart Avenue) would depend upon the scheduling of the projects. The Proposed Actions would include the addition of stationary sources (boilers or furnaces for space heating), but these would not be significant. The Proposed Actions conform to the SIP and are exempt from further conformity review (this is discussed in more detail below). Impacts from the West Gate Alternative and Northeast Gate Alternatives would be similar to those from the Proposed Action and not significant. Impacts from the No Action Alternative would not be significant.

4.1.1 Analysis Methods

The analysis was based on a review of existing air quality in the region, information on Peterson AFB air emission sources, projections of emissions from the proposed activities, a review of the Federal and Colorado regulations for air quality, and the use of the latest air emission factors from the USEPA and the U.S. Air Force Institute for Environment, Safety, and Occupational Health Risk Analysis.

Emissions from proposed construction were assessed, as well as emissions from furnaces and boilers. All emissions were estimated using the latest available emission factors (Chapter 5 and Appendix C provide references to specific factors used). Emissions from construction and operation of facilities were estimated with USEPA and USAF factors.

The amount of grading and earthwork was estimated by overlaying the proposed construction of facilities and roads on a topographic map and estimating approximate amounts of earthwork to create a level road or building surface.

4.1.2 Potential Impacts of the Proposed Action

Construction of the proposed facilities and pavements would generate emissions of criteria pollutants from grading and excavating, operation of construction equipment, trucks driving on paved and unpaved roads, worker vehicles, and hot mix asphalt plants. Approximately 2.5 acres would be disturbed during construction of proposed facilities at the East Gate in FY 05. About 30 acres would be disturbed for construction of facilities at the West Gate and improvements to Stewart Avenue, and extending Paine Street in FYs 06 and 07. An additional 28 acres would be disturbed for construction of facilities at the North Gate, the addition of a proposed Northeast gate, and road improvements to Stewart Avenue. Estimated emissions from these sources are shown in Table 4.1-1. The estimated emissions are based on the proposed schedule discussed in Section 2.1.

Table 4.1-1
Air Pollutant Generation from the Proposed Actions
Proposed Actions (tons per year)

Estimated Emissions	CO	VOC	NO_x	SO_x	PM_{10}	HAPs
2004/2005						
Construction East Gate	1.96	0.27	3.48	0.57	0.81[1]	0.07
Total	**1.96**	**0.27**	**3.48**	**0.57**	**0.81**	**0.07**
2005						
Operation East Gate Facilities	0.04	0.00	0.05	0.00	0.00	0.00
Total	**0.04**	**0.00**	**0.05**	**0.00**	**0.00**	**0.00**
2006						
Construction West Gate	6.60	0.64	9.75	1.58	3.04[1]	0.16
Construction Extend Paine Street	3.05	0.26	4.09	0.66	1.23	0.06
Operation East Gate Facilities	0.04	0.00	0.05	0.00	0.00	0.00
Total	**9.68**	**0.90**	**13.89**	**2.23**	**4.27**	**0.22**
2007						
Construction West Gate	6.60	0.64	9.75	1.58	3.04[1]	0.16
Construction Extend Paine Street	3.05	0.26	4.09	0.66	1.23	0.06
Operation East Gate Facilities	0.04	0.00	0.05	0.00	0.00	0.00
Total	**9.68**	**0.90**	**13.89**	**2.23**	**4.27**	**0.22**
Future years[2]						
North Gate[3]	1.98	0.21	2.96	0.48	0.95	0.05
Northeast Gate	2.67	0.30	4.19	0.68	1.29	0.07
Widen Stewart Ave[3]	3.98	0.42	6.63	1.07	1.86	0.11
Realign Stewart and Mitchell[3]	3.50	0.39	5.91	0.95	1.73	0.10
Regionally significant	**10,687.20**					
Conformity thresholds	**100.00**					

[1] Emissions are for uncontrolled dust sources.

[2] Projects are planned, but not yet programmed for a specific year

[3] Estimated emissions from construction each year for two years.

Source: Calculated with emission factors from *Air Pollutant Emission Factors (AP-4*2) (USEPA, 1995; USEPA, 1998a; USEPA, 1998b; USEPA, 2000; USEPA, 2001a; USEPA, 2001b; USEPA, 2003a; USEPA, 2003b; USEPA, 2004), *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling – Compression – Ignition* (USEPA, 2002), *Analysis of the Impacts of Control Programs on Motor Vehicle Toxics Emissions and Exposure in Urban Areas and Nationwide* (USEPA, 1999), and Air Emission Inventory Guidance for Mobile Sources (USAF, 2002). The assumptions and specific emission factors used are documented in Appendix C.

Regionally significance and conformity thresholds per 40 CFR 51, Subpart W

Fugitive dust emissions (including PM_{10}) would be generated from grading and fill operations, and truck trips on paved and unpaved roads during construction. A grading permit for fugitive particulate emissions would be required from El Paso County for disturbing more than one acre of ground (for each of the proposed projects). As discussed in Section 3.1.3, this permit would require the completion of a drainage plan and an erosion control plan. The erosion control plan would include mandatory practices to limit soil erosion (from wind and water). Some of the required measures would control fugitive dust. A Colorado APEN would not be required for construction of proposed facilities at the East Gate because grading and excavating would take less than six months and disturb less than 25 acres. An APEN would likely be required for PM_{10} emissions for proposed construction of facilities at the West Gate and improvements to Stewart Avenue, and extending Paine Street because these projects would likely occur concurrently, total more than 25 acres, and disturb land for more than six months (the time of land disturbance begins with initial grading and clearing and ends when the disturbed ground is stabilized through compaction or revegetation (Akins, 2004). This APEN would require the implementation of fugitive dust control measures from onsite unpaved roads, disturbed soil, and mud and dirt on paved roads adjacent to the site. These measures would include application of water and chemical stabilizers, revegetation, temporary furrows, and synthetic or natural coverings (netting or mulching) to disturbed areas as needed, to reduce fugitive dust (a source of PM_{10}) levels by 80 percent from uncontrolled levels. The potential need for an APEN for the remaining projects has not yet been programmed (North and Northeast Gates, realigning Stewart Avenue and Mitchell Street, and widening Stewart Avenue) and would depend upon the scheduling of the projects. An APEN would be required if concurrent projects would disturb more than 25 acres for more than six months.

Concrete batch mixing and batch mix asphalt plant operations would likely occur off base and would not require an APEN (operation of these facilities would be covered by existing owners' APENs, if applicable). Stationary source emissions would be generated during construction from the batch mix asphalt plant and fugitive dust, and from operation of proposed facilities, primarily from natural gas furnaces and boilers for heating (see Table 4.1-2).

Using the current estimates for the furnaces and boilers, operation of these items would generate less than two tons per year of any criteria pollutant (see Tables 4.1-1 and 4.1-2), and an APEN would not be required. The proposed stationary sources (furnaces or boilers for heating) would also be below the thresholds for PSD requirements, and total estimated emissions (actual and potential) for Peterson AFB would remain below 250 tons per year (see Tables 4.1-2 and 4.1-3). Stationary source emissions at Peterson AFB would increase only slightly, and would not be significant.

Estimated emissions from the Proposed Actions would not exceed the NAAQS or CAAQS due to the amount of criteria pollutants generated (see Tables 4.1-1 and 4.1-2), the relatively large area in which the emissions would occur, and the dispersive meteorological conditions in which the emissions would be generated. Therefore, the focus of the analysis centers on conformity with the SIP for the CO maintenance area.

Peterson AFB, as part of the Colorado Springs Metropolitan Area, is located within a maintenance area for CO. Emissions would be regionally significant if they exceeded 10 percent of the emission inventory for any affected pollutant (in this case, CO). The SIP budget for CO in the Colorado Springs Metropolitan Area is 292.8 tons per day (106,872 tons per year). Estimated emissions from the Proposed Action (stationary and mobile) do not comprise 10 percent of the daily inventory in any year and are not regionally significant.

Table 4.1-2
Air Pollutant Generation from Stationary Sources
Proposed Action (tons per year)

Estimated Emissions	CO	VOC	NO_x	SO_x	PM_{10}	HAPs
2004/2005						
Construction – Batch Mix Asphalt Plant[1]	0.53	0.01	0.03	0.01	0.04	0.00
Construction – Fugitive Dust					0.54	
Total	**0.53**	**0.01**	**0.03**	**0.01**	**0.58**	**0.00**
Existing Stationary Sources Basewide	17.98	48.94	24.48	0.35	10.52	4.54
Total with Proposed Action	**18.51**	**48.95**	**24.51**	**0.36**	**11.10**	**4.54**
2005						
Operation East Gate Facilities	0.04	0.00	0.05	0.00	0.00	0.00
Total	**0.04**	**0.00**	**0.05**	**0.00**	**0.00**	**0.00**
Existing Stationary Sources Basewide	17.98	48.94	24.48	0.35	10.52	4.54
Total with Proposed Action	**18.04**	**48.94**	**24.53**	**0.35**	**10.52**	**4.54**
2006						
Construction – Asphalt Plant[1,2]	2.65	0.05	0.17	0.03	0.18	0.00
Construction –Asphalt Plant[1,3]	1.26	0.03	0.08	0.01	0.08	0.00
Construction – Fugitive Dust[2]					2.43	
Construction – Fugitive Dust[3]					0.96	
Operation East Gate Facilities	0.04	0.00	0.05	0.00	0.00	0.00
Total	**3.95**	**0.08**	**0.29**	**0.05**	**3.66**	**0.00**
Existing Stationary Sources Basewide	17.98	48.94	24.48	0.35	10.52	4.54
Total with Proposed Action	**21.93**	**49.02**	**24.77**	**0.40**	**14.18**	**4.54**
2007						
Construction – Asphalt Plant[1,2]	2.65	0.05	0.17	0.03	0.18	0.00
Construction –Asphalt Plant[1,3]	1.26	0.03	0.08	0.01	0.08	0.00
Construction – Fugitive Dust[2]					2.43	
Construction – Fugitive Dust[3]					0.96	
Operation East Gate Facilities	0.04	0.00	0.05	0.00	0.00	0.00
Total	**3.95**	**0.08**	**0.29**	**0.05**	**3.66**	**0.00**
Existing Stationary Sources Basewide	17.98	48.94	24.48	0.35	10.52	4.54
Total with Proposed Action	**21.93**	**49.02**	**24.77**	**0.40**	**14.18**	**4.54**
Future Years						
Operation all Proposed Facilities[4]	0.12	0.01	0.14	0.00	0.01	0.00
Existing Stationary Sources Basewide	17.98	48.94	24.48	0.35	10.52	4.54
Total with Proposed Action	**18.10**	**48.95**	**24.62**	**0.35**	**10.53**	**4.54**

[1] Offsite, but considered an indirect source as it results from construction at Peterson AFB

[2] West Gate Construction

[3] Extend Paine Street Construction

[4] Total estimated actual emissions from East, West, North, and proposed Northeast Gates.

Note: Projects which are planned, but not currently programmed (North Gate, Northeast Gate, realign Stewart Ave and Mitchell Street, and widen Stewart Ave) would generate only small amounts of criteria pollutants (2 tons or less CO from operation of an asphalt plant, and a few hundredths of tons of other criteria pollutants from operation of furnaces or boilers for heating facilities at the gates).

Source: Calculated with emission factors from *Air Pollutant Emission Factors (AP-4*2) (USEPA, 1995; USEPA, 1998a; USEPA, 1998b; USEPA, 2000; USEPA, 2001a; USEPA, 2001b; USEPA, 2003a, 2003b; USEPA, 2004), *Exhaust and Crankcase Emission Factors for Non-road Engine Modeling* (USEPA, 2002),and *Air Emission Inventory Guidance for Mobile Sources* (USAF, 2002). The assumptions and specific emission factors used are documented in Appendix C.

Table 4.1-3
Air Pollutant Generation from Stationary Sources
Potential to Emit (tons per year)

Estimated Potential to Emit[1]	CO	VOC	NO_x	SO_x	PM_{10}	HAPs
2004/2005						
Construction East Gate	0.53	0.01	0.03	0.01	0.58	0.00
Existing Stationary Sources Basewide	50.03	122.13	147.89	5.25	126.24	10.12
Total	**50.56**	**122.14**	**147.92**	**5.26**	**126.82**	**10.12**
2005						
Operation East Gate Facilities	0.08	0.01	0.10	0.00	0.01	0.00
Existing Stationary Sources Basewide	50.03	122.13	147.89	5.25	126.24	10.12
Total	**50.11**	**122.14**	**147.99**	**5.25**	**126.25**	**10.12**
2006						
Construction West Gate, Paine Street	3.91	0.08	0.25	0.04	3.65	0.00
Operation East Gate Facilities	0.08	0.01	0.10	0.00	0.01	0.00
Existing Stationary Sources Basewide	50.03	122.13	147.89	5.25	126.24	10.12
Total	**54.02**	**122.22**	**148.24**	**5.29**	**129.90**	**10.12**
2007						
Construction West Gate, Paine Street	3.91	0.08	0.25	0.04	3.65	0.00
Operation East Gate Facilities	0.08	0.01	0.10	0.00	0.01	0.00
Existing Stationary Sources Basewide	50.03	122.13	147.89	5.25	126.24	10.12
Total	**54.02**	**122.22**	**148.24**	**5.29**	**129.90**	**10.12**
Future Years, Operation						
Operation all Proposed Facilities[2]	0.24	0.02	0.28	0.00	0.02	0.00
Existing Stationary Sources Basewide	50.03	122.13	147.89	5.25	126.24	10.12
Total with Proposed Action	**50.27**	**122.15**	**148.17**	**5.25**	**126.26**	**10.12**

[1] Stationary sources. Includes indirect source as that result from construction at Peterson AFB

[2] Includes estimated potential to emit from East, West, North, and proposed Northeast Gates.

Note: Projects which are planned, but not currently programmed (North Gate, Northeast Gate, realign Stewart Ave and Mitchell Street, and widen Stewart Ave) would generate only small amounts of criteria pollutants (4 tons or less CO from operation of an asphalt plant, and a few hundredths of tons of other criteria pollutants from operation of furnaces or boilers for heating facilities at the gates).

Source: Calculated with emission factors from *Air Pollutant Emission Factors (AP-4*2) (USEPA, 1995; USEPA, 1998a; USEPA, 1998b; USEPA, 2000; USEPA, 2001a; USEPA, 2001b; USEPA, 2003a, 2003b; USEPA, 2004), *Exhaust and Crankcase Emission Factors for Non-road Engine Modeling* (USEPA, 2002),and *Air Emission Inventory Guidance for Mobile Sources* (USAF, 2002). The assumptions and specific emission factors used are documented in Appendix C.

Conformity thresholds, as defined in 40 CFR 51, Subpart W, are used to determine conformity with a SIP. The threshold for CO is 100 tons per year (shown in Table 4.1-1). The exceedance of this threshold would result in non-conformity with the SIP. Estimated emissions from the Proposed Actions would conform to the SIP and are not significant. The Proposed Actions are not regionally significant and the total direct and indirect emissions would be below the 100 tons per year de minimus threshold for CO. Therefore, this project is exempt from further conformity analysis pursuant to 40 CFR 93.153.

Construction equipment, the batch mix asphalt plant, and operation of furnaces and boilers would also generate small amounts of HAPs. These would total less than 0.23 tons per year during construction and less than 0.01 tons per year during operation, and would not substantially increase the generation of HAPs at Peterson AFB. The base would remain a minor source of HAPs. In accordance with the Operating Permit, and Colorado Regulation 3, Part B, Section III.A.6 and Part C, Section X, the amount of HAPs generated each year would need to be estimated and reported annually.

Detailed calculations of the estimated emissions produced by these proposed activities are shown in Appendix C. Because the activities would not exceed or contribute to an exceedance of air quality standards and would conform with the SIP, the impacts would not be significant. No other air pollutants of note would be generated during the Proposed Action.

The Proposed Action would have an unavoidable short-term impact on air quality. However, as discussed above, the impact to air quality would not be significant.

4.1.3 Potential Impacts of the West Gate Alternative

All impacts to air quality would be the same as the Proposed Action, with the exception slightly lower emissions from construction of the proposed bridge across East Branch Sand Creek. Support piers would not be constructed as part of this option; this would result in a slightly reduced construction effort. Operational emissions would be the same as the Proposed Action, primarily generated from space heating of facilities. Impacts to air quality would not be significant under this Alternative.

4.1.4 Potential Impacts of the Northeast Gate Alternatives

Impacts to air quality would be nearly the same as the Proposed Action. The three alternate routes for the access road to the proposed gate would be between 300 and 1,500 feet longer than the Proposed Action route. Slightly higher construction emissions for constructing this gate would result, but the impacts to air quality would still not be significant. All other sources of emissions would be the same as the Proposed Action.

4.1.5 Potential Impacts of the No Action Alternative

The No Action Alternative would not change direct emissions from current levels. Indirect emissions generated by motor vehicle traffic would likely increase as traffic congestion continues to increase at base gates. However, any increases in emissions would not be significant due to the limited amount of increase in emissions, improving air quality in the Colorado Springs area, and the proportion of traffic at Peterson AFB compared to the metropolitan Colorado Springs area.

4.1.6 Mitigation Measures

As discussed above, the Proposed Action would require an El Paso County grading permit for all proposed projects and an APEN from the State of Colorado for the West Gate and extension of Paine Street construction. Both of these requirements contain mandatory controls to reduce potential erosion and fugitive dust through best management practices (discussed above). No mitigations would be required.

4.2 GEOLOGICAL RESOURCES

Geological resources are limited, non-renewable earth resources whose characteristics can easily be degraded by physical disturbances. Impacts to geological resources would result primarily from disturbance of the ground from construction (excavation and grading) activities. These activities would affect the underlying geology to a depth of up to 8 to 10 feet in the vicinity of the proposed buildings. Topography and soils would be directly impacted from excavation, grading, and compaction by heavy equipment during construction. The Proposed Action would result in about 59 acres being disturbed; impacts would not be significant. Measures to control water and wind erosion would be implemented in accordance with permitting requirements (discussed below). Impacts from the West Gate and Northeast Gate Alternatives would be similar to the Proposed Action. Geological resources would not be impacted under the No Action Alternative.

4.2.1 Analysis Methods

The geological resources within the proposed project areas were studied to determine the potential impacts from implementing the Proposed Action, West Gate and Northeast Gate Alternatives, or No Action Alternative. Geological studies, El Paso County soil survey, previous EAs, topographic contours from Peterson AFB, a visual site inspection of the project areas, and a USGS topographical map were reviewed to characterize the existing environment. Construction activities that could influence geological resources were evaluated to predict the type and magnitude of potential impacts. For example, soils would be disturbed during construction activities, especially during excavation and grading for the proposed facility construction and road improvements. The predicted post-construction environment was compared to the existing environment and the change was evaluated to determine if significant changes in any existing conditions would occur.

4.2.2 Potential Impacts of the Proposed Action

The depth to which the underlying geological layers would be impacted varies. Excavations for the buildings could reach 8 to 10 feet in some areas. Excavations and pile driving for the proposed West Gate bridge could range up to 15 to 20 feet (or possibly somewhat deeper), depending on the final design and engineering requirements for the bridge. Grading for road improvements would generally be limited to 5 feet or less, exceptions would be areas of steeper slopes along the proposed route for Stewart Avenue west of the creek (slopes up to 30 percent) and the extension of Paine Street (a small area with slopes up to 21 percent). Grading for proposed road improvements would generally affect a corridor up to 70 feet wide. Site preparation and construction of proposed facilities at all gates would require excavation, extensions, and reburial of underground lines for water, natural gas, sanitary sewer, and electricity. As discussed in Section 3.2, the material underlying soils is mainly unconsolidated alluvium to a depth of 100 to 200 feet. This material would be moderately to highly vulnerable to wind erosion while it is disturbed. As discussed in Section 3.2.2 and 3.3.2, the Proposed Action would require a NPDES permit (see Section 4.3.2), an El Paso County grading permit, and an APEN from the

State of Colorado. All of these requirements contain mandatory controls to reduce potential erosion. Permit requirements would include daily watering or chemical stabilization of exposed surfaces, maintaining existing vegetation as much as possible, revegetating sites as soon as possible, limiting vehicle speeds or gravelling temporary roads, wind breaks, temporary compaction, or synthetic or natural covering, such as netting or mulching. The El Paso County Land Development Code also requires a final site plan for stabilizing steep slopes and limiting storm water runoff from completed structures. The best management practices listed above would be implemented in accordance with County requirements. Impacts to geological resources would not be significant.

As discussed in Section 3.2.1, there are no major faults in the project area. The area is located in Zone 1 for potential earthquake damage with slight damage anticipated from any seismic event (USAF, 1992) with expected magnitudes in the range of 4.0 to 4.4 on the Richter Scale (V to VI on the Modified Mercalli Scale). Depending on the exact design of the guardhouse and vehicle inspection facilities buildings, seismic design parameters might be required as a Category I Essential Facilities. Impacts from seismicity would not be significant.

The sites of the proposed facilities range in elevation from 6,170 feet to about 6,285 feet. Slopes are generally between one and five percent, with steeper slopes in some areas. Slopes near East Branch Sand Creek where the proposed bridge would be constructed and an area along the proposed route for widening Stewart Avenue west of the creek range up to 30 percent. A small area along the proposed route for extending Paine Street has slopes up to 21 percent. The area where an access road would be constructed for the East Gate vehicle inspection area has slopes up to nine percent. In accordance to requirements in the El Paso County grading permit and Colorado APEN, adequate slopes would be graded after excavation is completed to insure slope stability and proper drainage. Impacts to topography are not anticipated to be significant.

The soils potentially impacted by the Proposed Action are discussed in Section 3.2.2. Table 4.2-1 summarizes the soils impacted by each project comprising the Proposed Action. The Proposed Action would primarily impact areas of Blakeland loamy sand and Truckton sandy loam. An El Paso County grading permit would be required for all of the proposed projects. This permit would require a grading and erosion control plan to incorporate best management practices to control storm water flow and the potential discharge of pollutants.

East Gate. The proposed upgrades to the East Gate would impact about 2.5 acres of Blakeland soil for about six months. Most of the construction would occur in an area with slopes of about three percent; however, construction of an access road to the proposed vehicle inspection facility would impact soils with slopes up to nine percent. Potential erosion could be substantial during high winds and dry conditions or during heavy storm events. These impacts would not be significant due to the limited duration and area of disturbance. The Best Management Practices required by the county permit would limit water erosion, and to some extent, wind erosion.

Table 4.2-1 Soils Disturbed by the Proposed Action					
Project	**Soil series**	**Acres Disturbed**	**Slope**	**Erosion**	
				Wind	**Water**
East Gate	Blakeland	2.5	3 to 9	Severe	Moderate
West Gate	Truckton, Blakeland, Ellicott	22	1.5 to 30	Moderate to severe	Moderate to high
North Gate[1]	Truckton, Blakeland	10	2 to 2.5	Moderate to severe	Moderate
Northeast Gate	Blakeland	3	1.5 to 5	Severe	Moderate
Extend Paine Street	Blakeland	8	1 to 21	Severe	Moderate
Realign Stewart and Mitchell	Blakeland	6.5	1 to 4	Severe	Moderate
Widen Stewart Ave	Blakeland, Blendon	8.5	1 to 5	Moderate to severe	Moderate

[1] Acreage disturbed includes a potential entrance road realignment.

West Gate. The proposed upgrades to the West Gate would impact about 22 acres of Blakeland, Truckton, and Ellicott soils for about 18 months. Most of the construction would occur in an area of Truckton soils with slopes of about three to six percent. Construction of the proposed bridge and portions of Stewart Avenue east and west of the creek would occur in Ellicott soils with slopes up to 30 percent. Widening of Stewart Avenue west of the creek would affect an area of Truckton soils with slopes up to 30 percent. A small area of Blakeland soils west of the creek with slopes around nine percent would also be impacted. The slope along this route would need to be cut to some extent to accommodate the route of the road. Soil removed from here could potentially be used to raise the level of the road bed for Stewart Avenue east of the creek. Erosion could be substantial near the creek, as this area is highly vulnerable to erosion by water. The required Nationwide Permits issued through the USACE (see Section 4.3.2) include provisions to control soil erosion. Any additional controls required under the required NPDES permit (see Section 4.3.2) would also limit potential erosion. Impacts to soils would not be significant.

As discussed in Section 3.2.2, an area of land proposed for acquisition to construct the realigned Stewart Avenue contains a construction debris pile used for stockpiling organic earth fill, asphalt, concrete, soil, and piping materials from broken waterlines and minor construction projects. A sludge pit, formerly used for placing sludge from sewage evaporation ponds is located just north of the proposed property acquisition line, no portion of the sludge pit will be included in the purchase from Cherokee Sanitation District. The sludge pit would not be impacted by construction. The southern part of the construction debris pile would be disturbed by construction activities (grading and paving for the realigned Stewart Avenue). Soil sampling detected arsenic (from less than 1 to 11 mg/kg) near the debris pile. Road construction would generally disturb soil to a depth of 2 to 4 feet and would generate fugitive dust containing traces of arsenic. Fugitive dust would be controlled by measures required for an APEN for air quality (see Section 4.1.2). Detected levels of arsenic were within normal background levels for the Front Range and are not a concern (Smith, 2004).

Paine Street Extension. The proposed extension of Paine Street could occur simultaneously or overlap the timeframe of the West Gate improvements. This project would impact 8 acres of Blakeland soil for about 12 months. Due to this overlap of projects, an APEN for land development may be needed because the area impact would exceed 25 acres for longer than 6 months. Grading activities would also be subject to a county grading permit. As discussed above, the county permit requires an erosion control plan to limit storm water runoff and discharge of pollutants (including sediment) to streams. The APEN would require measures to reduce fugitive dust by 80 percent. Water erosion could be substantial in areas of higher slope, especially in the Truckton and Ellicott soils near and west of the creek. Areas excavated for construction of the bridge would be particularly vulnerable to erosion, especially in times of higher stream flow after spring and summer storms when this soil experiences brief, frequent flooding. However, potential erosion would be controlled through measures specified in the county permit and would not be significant. Wind erosion could be substantial in exposed areas, but would be controlled through measures required in the APEN, and would not be significant.

Disturbed soils would need to be compacted properly and revegetated upon completion of the projects to prevent surface erosion and a form of erosion known as piping, where water erosion occurs below the surface and causes subsidence. The Truckton soils are subject to frost heave and roads and pavements need to be designed to overcome this hazard. All slopes would need to be stabilized after construction is completed, in accordance with the grading and erosion control plan that would be required for the county grading permit. Slopes along the stream bank would be particularly vulnerable to erosion. The USFWS recommends the use of small riprap and planting willow trees to stabilize side slopes of the stream channel (USFWS, 2004a).

North Gate. Proposed improvements at the North Gate would disturb up to 10 acres of Truckton and Blakeland soils for about 12 months. Construction would occur in areas of 2 to 2.5 percent slope. If construction is limited to a vehicle inspection facility, about one acre would be disturbed. If Peterson Boulevard is rerouted, or a new access road is built to provide more stacking room for vehicles, an additional area would be impacted (potentially up to 10 acres). A county grading permit would be required and would include measures to control storm water runoff and discharge of sediment and other pollutants. Impacts to soils would not be significant.

Northeast Gate. Construction of a proposed Northeast Gate would impact about three acres of Blakeland soil for about nine months. Construction would occur in an area with slopes of 1.5 to 5 percent. A county grading permit would be required (including measures to control storm water runoff and discharge of sediment and other pollutants). Impacts to soils would not be significant.

Realignment of Stewart Avenue and Mitchell Street. Proposed realignment of Stewart Avenue and Mitchell Street would disturb about 6.5 acres of Blakeland soil for about 18 months. Construction would occur in an area with slopes of one to four percent. Potential impacts to soils would not be significant. Grading permit Best Management Practice requirements would reduce erosion and storm water runoff.

Widen Stewart Avenue. Proposed widening of Stewart Avenue would disturb about 8.5 acres of Blakeland and Blendon soil for about 18 months. Construction would occur in an area with slopes of one to five percent. The design for the portion of the road traversing the Blendon soils would need to take into account the moderate potential for frost heave and the low load bearing strength of this soil. Potential erosion would be limited by Best Management Practices required for the county grading permit. Impacts to soils would not be significant.

The proposed projects for the North and Northeast Gates, realigning Stewart Avenue and Mitchell Street, and widening Stewart Avenue have not been programmed yet, and it is not yet known if construction of any of these projects would occur simultaneously, or if the timeframe would overlap. If these projects do occur within the same timeframe, and the area affected exceeds 25 acres for more than six months, a Colorado APEN would be needed to control fugitive dust from grading and construction activities. Impacts to soil would not be significant if these projects would occur in the same timeframe.

Impacts to water resources from grading and construction activities are discussed in Section 4.3.

Long-term soil productivity in affected areas would not be significantly impacted. Topsoil would be restored to disturbed areas and vegetation would be reestablished, maintaining soil productivity.

4.2.3 Potential Impacts of the West Gate Alternative

Construction of a single-span bridge (with no vertical support piers) would impact soils in the vicinity of East Branch Sand Creek to a lesser extent than the Proposed Action. The amount of soil disturbed, and the potential for erosion, would be less than the Proposed Action. Best Management Practice requirements of the NPDES permit, county grading permit and the Colorado APEN (if applicable) would control erosion and impacts to soils would not be significant.

4.2.4 Potential Impacts of the Northeast Gate Alternatives

Impacts to geological resources would be nearly the same as the Proposed Action. The three alternate routes for the access road to the proposed gate would be between 300 and 1,500 feet longer than the Proposed Action route and disturb somewhat more soil. No additional soil types would be disturbed for alternative routes. Slightly higher amounts of erosion could potentially occur, but the impacts would still not be significant.

4.2.5 Potential Impacts of the No Action Alternative

The proposed improvements to gates and base roads would not be constructed under the No Action Alternative; therefore, geological resources would not be impacted.

4.2.6 Mitigation Measures

As discussed above, the Proposed Action would require an El Paso County grading permit and an APEN from the State of Colorado. Both of these requirements contain mandatory controls to reduce potential erosion and discharge of sediment through best management practices (discussed above). No mitigations would be required.

4.3 WATER RESOURCES

Excavations for the proposed force protection upgrades and transportation improvements would disturb about 0.1 acres of the unconfined surficial aquifer near the West Gate. Impacts to groundwater would not be significant. Impacts to surface water from erosion or storm water runoff would not be significant. A NPDES permit for construction would be required for each project. The proposed bridge over the East Branch of Sand Creek would impact less than one-half acre of the 100-year floodplain, and USACE Nationwide Permits would be required. There would not be any long-term impacts to water resources from the Proposed Actions. The West Gate Alternative would impact the East Branch of Sand Creek less than the Proposed Action and would not be significant. Impacts from the Northeast Gate Alternatives would be similar to the Proposed Action. If the No Action Alternative were selected, there would be no change in water resources.

4.3.1 Analysis Methods

To establish the potential impacts of the Proposed Action, the West Gate and Northeast Gate Alternatives, and the No Action Alternative, documents on the hydrology and hydrogeology of the area were reviewed. Maps showing topography, watersheds, aquifers, and base drainage were examined. The review focused on the proximity of the proposed activities to surface waters, hydrogeology in the project area, and water quality in the local area, and evaluated the effects of the actions with regard to those factors. Regulatory requirements and the need for permits were also reviewed.

4.3.2 Potential Impacts of the Proposed Action

The Sand Creek Alluvial Aquifer underlies the areas that would be impacted by the West and North Gate improvements, and where Stewart Avenue and Mitchell Street would be realigned. The depth of this aquifer varies from about 12 feet near the West Gate to a depth of about 100 feet farther from Sand Creek (see Section 3.3.1). A small area of this aquifer (less than 0.1 acres) would be disturbed during construction of the proposed bridge over the East Branch of Sand Creek. Due to the limited area and depth affected, impacts would not be significant. The Proposed Action at the North Gate and the intersection of Stewart Avenue and Mitchell Street would not impact this aquifer because of the greater depth to the aquifer at these locations. Other components of the Proposed Action would not impact the surficial aquifer. As discussed in Section 3.3.1, the Laramie-Fox Hills Aquifer (part of the Denver Basin aquifer System) underlies most of the project area (the only exception is the southern half of the proposed Stewart Ave widening on Peterson East). The Laramie-Fox Hills Aquifer ranges between 600 and 700 feet deep along the northern edge of Peterson

AFB and would not be impacted. The southern boundary of the Arapahoe Aquifer is about 2,000 feet north of the North Gate (about 1,000 feet north of the proposed site for the access road for the proposed northeast gate). The Denver Aquifer is about two miles north of the North Gate and proposed northeast gate project areas and the Dawson Aquifer is about six miles to the north. The Arapahoe, Denver, and Dawson Aquifers would not be impacted by the Proposed Action.

Due to the limited area of excavation over an aquifer, impacts to the hydrogeologic properties of the aquifers (recharge and hydraulic conductivity) would not be significant. A spill or leak of fuel or lubricants is not likely during excavation in this area, but if one occurs, it should be cleaned up immediately, in accordance with the Spill Response Plan, to prevent potential contamination of the aquifer. Given the small amount of oil and fluids used by construction equipment, and the depth to groundwater, where present, impacts would not be significant. The area affected by the proposed improvements to the East Gate and the southern half of the proposed Stewart Avenue widening on Peterson East do not overlie any defined aquifers and would not impact groundwater resources.

Disturbed areas would be vulnerable to water erosion during grading and excavation of the site. Sediment would be transported and deposited by water by surface flow in the local area. Water erosion could occur on steeper slopes near the proposed bridge over the East Branch of Sand Creek, the eastern part of areas impacted by the East Gate improvements, and some areas where Paine Street would be extended. The proposed bridge over the East Branch of Sand Creek would potentially cause water erosion and sedimentation to an area approximately 50 to 100 feet along both banks of the creek. Depending upon the final design, a new access road to the North Gate could affect an area about 350 feet from the East Branch of Sand Creek. Other improvements at the North Gate would be more than 1,600 feet from the creek. All of the other proposed projects would be more than 2,500 feet from the nearest stream. Realignment of Stewart Avenue and Mitchell Street would impact an area about 1,000 feet from Golf Course Pond 1.

A NPDES permit (administered through USEPA issued under NPDES General Permit for Discharge of Storm Water from Construction Activities) would be required for each of the proposed projects. Proposed improvements at the West Gate, extending Paine Street, realigning Stewart Avenue and Mitchell Street, and widening Stewart Avenue on Peterson East would require NPDES permits, as the acreage affected would exceed five acres. If a new access road is constructed at the North Gate, a NPDES permit would be required if construction of the proposed road affects more than five acres. Constructing the vehicle inspection facility and proposed improvements at the East Gate and the proposed Northeast Gate would also require a NPDES permit. Appropriate erosion and sediment controls would be implemented and maintained throughout the construction timeframe. As discussed in Section 3.3.1, a sludge pit is just north of the boundary of the land to be acquired for the realigned Stewart Avenue and West Gate. Part of the area where the debris pile was located would be disturbed during construction of the road. The underlying alluvial aquifer (at a depth of 31 to greater than 55 feet in this area) would not be disturbed due to the limited depth of excavation (two to four feet). Potential soil erosion from grading would be controlled through measures required through the NPDES permit and nationwide permits issued through the USACE. All planned construction activities would be conducted in accordance with the permits, and impacts from potential erosion would not be significant. Sampling conducted as part of an Environmental Baseline Survey for the property acquisition detected arsenic in the soil (up to 11 mg/kg) and filtered groundwater samples taken in September 2002 indicated chromium, copper, and lead above MCLs for primary drinking water standards. Further sampling in August 2003 did not detect any pollutant above MCLs. Sampling for volatile and semivolatile compounds, and pesticides detected levels below MCLs. Ambient standards have not yet been established for metals in groundwater or streams under Section 307 of the *Clean Water Act* (as regulated under 40 CFR 401.15). During excavation and dewatering to construct supports for the proposed bridge, small amounts of sediment would be discharged. Sampling results indicated that concentrations of metals and other pollutants were below MCLs, would not violate any established standards for ambient water quality, and any sediment discharged would not significantly impact water quality in the East Branch of Sand Creek or the local alluvial aquifer.

The East Branch of Sand Creek is defined as waters of the U.S. and a 100-year floodplain has been delineated by FEMA. The Proposed Action includes constructing a bridge over the creek, within the 100-year floodplain. USACE nationwide permits 13, 14, and 33 would be needed to construct the bridge. Nationwide permit 13 governs bank stabilization for erosion control for projects not exceeding 500 feet in length. Up to one cubic yard of material per linear feet of stream can be placed on stream banks for stabilization under this permit. Nationwide permit 14 governs linear transportation projects, such as bridges. Any fill placed along the stream banks must not cause the loss of ½ acre or more of waters of the U.S. and must be limited to the minimum necessary for the crossing. Any permanent loss of waters of the U.S. must be compensated for as mitigation. Nationwide permit 33 regulates temporary structures, work, and discharges for dewatering (including cofferdams). Appropriate measures must be taken to maintain near normal downstream flows and to minimize flooding. Fill must be of materials, and placed in a manner, that will not be eroded by expected high flows. The use of dredged material may be allowed if it is determined by the District Engineer that it will not cause more than minimal adverse effects on aquatic resources. Temporary fill must be entirely removed to upland areas, or dredged material returned to its original location, following completion of the construction activity, and the affected areas must be restored to the pre-project conditions.

General Condition 26 of the nationwide permits requires the permittee to construct the activity in accordance with FEMA or FEMA-approved local floodplain construction requirements to minimize adverse effects to flood flows in 100-year floodplains. The Pikes Peak Regional Floodplain Administration reviews proposed construction (including bridges) in floodplains within the County. The need for a permit depends upon the degree of impact to the floodplain from the bridge. The criteria for a permit is zero rise in the floodplain height or width. If the bridge design is such that the floodplain would rise in elevation or increase in width, a Conditional Letter of Map

Revision for the FEMA floodplain map would be required. Because the bridge would be constructed within the floodplain, a Finding of No Practicable Alternative (FONPA) would need to be prepared in accordance with EO 11988 and AFI 32-7064 (see Section 3.3). All permit requirements would be followed during construction and impacts would not be significant.

Proposed improvements to Stewart Avenue near the West Gate would also impact areas within 300 feet of the floodplain. Proposed improvements to the North Gate could potentially impact areas about 260 feet from the floodplain. The Proposed Action at the East Gate, Northeast Gate, extension of Paine Street, realignment of Stewart Avenue and Mitchell Street, and on Peterson East would not impact floodplains.

If the proposed bridge over the East Branch of Sand Creek is constructed according to the current concept design, the existing storm water sewer outfall north of the existing bridge would remain in place. Storm water sewers from the modified Stewart Ave, West Gate, and vehicle inspection facility would drain to this outfall, slightly increasing the volume of discharge to this outfall. This outfall already discharges storm water outfall from much of the northern part of the base, and the increase in discharge would not be significant. If the design is changed affecting the location of the outfall, a new outfall would be constructed as close as possible to the existing location. Construction of a new outfall could be done under a USACE Nationwide Permit 7. None of the other proposed projects would impact outfalls.

Disturbed areas would also be vulnerable to wind erosion during grading and excavation of the site. Particulate matter could be transported and deposited by wind in the local area. The County and State permits also contain provisions for controlling fugitive dust (see Sections 3.1.3 and 4.1.2). Deposition of particulate matter and siltation of streams would not be significant due to the dispersive wind conditions and limited amounts of particulate matter that would be generated by the Proposed Action. Impacts to water quality would not be significant.

Construction of the proposed force protection upgrades and transportation improvements would increase impermeable surfaces by about 28 acres, slightly decreasing the recharge area of the unconfined surficial aquifer and increasing storm water runoff. The Proposed Actions would impact 25 acres of the potential recharge area of the Laramie-Fox Hills Aquifer (out of 7,000 square miles) and about 20 acres of a seasonally saturated part area of the Sand Creek Aquifer (about 0.1 percent of the recharge area). Impacts to the aquifer would not be significant.

Storm water runoff would increase from impermeable surfaces (impermeable surfaces would increase by about 28 acres). Storm water drainage would be installed as part of the Proposed Actions. Storm water drainage would be tied into existing systems where available (for the majority of the base). Peterson AFB is currently conducting a storm water drainage study to determine the best method of managing storm water runoff on Peterson East and adjacent areas. Current options are to construct a new 10 to 12 acre detention pond east of Runway 17L/35R (see Figure 2.1-2), or transport storm water east of Marksheffel Road to an outlet within the Jimmy Camp Creek drainage basin. This study is expected to be completed by December 2004. Any improvements on Peterson East constructed before implementation of the study's findings would initially use overland flow or percolation, and then be retrofitted into the system in accordance with the planned action. Due to the limited acreage affected over a relatively large area, impacts from storm water runoff would not be significant.

Vehicles driving or parking on newly paved areas would slightly increase the amount of oil and grease potentially reaching surface water or aquifers. The risk of any spills reaching the storm water drainage system or soil would be low and impacts to water quality would not be significant.

4.3.3 Potential Impacts of the West Gate Alternative

Construction of a single-span bridge (with no vertical support piers) could avoid affecting the floodplain, or would impact the floodplain in the vicinity of East Branch Sand Creek to a lesser extent than the Proposed Action (potentially impacting very small areas for bridge supports on both edges of the floodplain). Vertical piers would not be placed in the floodplain as they would be under the Proposed Action. It is likely that dewatering would not be needed for this Alternative, or if it is needed, only a minor area for placement of supports near the edge of the floodplain. If construction of the bridge would impact the floodplain, USACE Nationwide Permits 13, 14, and 33 would potentially be needed, depending on the final design of the bridge and the specific area affected. If this Alternative would avoid impacting the floodplain, Nationwide Permits and a FONPA would not be needed. A FONPA would be needed if construction of the bridge affects the floodplain. The potential for water erosion would be slightly less under this Alternative. A NPDES permit would be required for the proposed West Gate improvements. The extent of impermeable surfaces and storm water runoff would be the same as the Proposed Action. Other proposed force protection upgrades and transportation improvements would impact water resources as described in the Proposed Action. Best Management Practice requirements of the NPDES permit, county grading permit and the Colorado APEN (if applicable) would control erosion and impacts to soils would not be significant.

4.3.4 Potential Impacts of the Northeast Gate Alternatives

Impacts to water resources would be nearly the same as the Proposed Action. The three alternate routes for the access road to the proposed gate would be between 300 and 1,500 feet longer than the Proposed Action route and affect slightly more land. None of the alternative routes are closer to surface water or aquifers than the Proposed Action. Slightly higher amounts of water erosion could potentially occur, but the impacts would still not be significant.

4.3.5 Potential Impacts of the No Action Alternative

Under the No Action Alternative, there would be no change to groundwater, surface water, or floodplains.

4.3.6 Mitigation Measures

Mitigation required by the USACE permits for waters of the U.S. including floodplains (avoiding, minimizing, rectifying, reducing or compensating) would be necessary to ensure that the adverse effects to the aquatic environment are minimal. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the U.S. during periods of low-flow or no-flow. For NWP 14 (Linear Transportation Projects), the preconstruction notification must include a compensatory mitigation proposal to offset permanent losses of waters of the U.S. and a statement describing how temporary losses of waters of the U.S. will be minimized to the maximum extent practicable. For NWP 33 (Temporary Construction, Access, and Dewatering), the preconstruction notification must also include a restoration plan of reasonable measures to avoid and minimize adverse effects to aquatic resources. To the maximum extent practicable, the activity must be designed to maintain preconstruction downstream flow conditions (e.g., location, capacity, and flow rates). Any sediment discharged must meet standards for ambient concentrations of toxic pollutants as defined under 40 CFR 401.15. Standards have been established for aldrin, dieldrin, DDT, DDD, DDE, endrin, toxaphene, benzidene, and PCBs, but not any metals.

As discussed above, the Proposed Action would require USACE Nationwide Permits, a NPDES permit, an El Paso County grading permit, and possibly an APEN from the State of Colorado. These permits contain provisions for mandatory controls to reduce potential erosion and discharge of sediment through best management practices.

4.4 BIOLOGICAL RESOURCES

Impacts to biological resources would result primarily from construction activities associated with the proposed force protection upgrades at the gates and transportation improvement projects. These activities would include digging, grading, stockpiling soil, and compaction from construction equipment. The effects of construction would minimally impact both vegetation and wildlife in the project areas. No critical habitat, threatened or endangered species, or wetlands would be affected by the Proposed Action. Therefore, impacts to biological resources would not be significant. Impacts from the west Gate and Northeast Gate Alternatives would be similar to the Proposed Action. Under the No Action Alternative, there would be no change in the biological environment in the project area.

4.4.1 Analysis Methods

The assessment of potential impacts to biological resources focused on the proposed locations for force protection upgrades and transportation improvements. The existing habitat was evaluated in areas with planned project activities. The Noxious Weed Survey of Peterson Air Force Base (USAF, 2003c), the Peterson AFB Integrated Natural Resources Management Plan (USAF, 1996), the Natural Heritage Inventory of the Rare Plants, Significant Natural Communities, and Animals (CNHP, 1997), and the Survey of Critical Biological Resources in El Paso County (CNHP, 2001) were reviewed along with past NEPA documents to provide data on existing biological resources in the project area.

4.4.2 Potential Impacts of the Proposed Action

The loss of approximately 59 acres of vegetation and temporary displacement of wildlife during construction activities would be an unavoidable impact, but not significant. Once the facilities have been constructed the open areas around the facility would be landscaped with native vegetation.

Vegetation. Of the 59 acres potentially disturbed by the Proposed Action, about 22 acres are in areas which have already been heavily modified by previous development or land use. About 37 acres have experienced only limited previous disturbance, primarily management of vegetation (mowing, weed control, or minor grading). Of the 59 acres, about 28 acres would be paved or built on. The remaining 31 acres would be restored as soon as practical after construction is completed. Best management practices and control measures, as required by the El Paso County grading permit and the Colorado APEN (see Sections 4.1, 4.2, and 4.3) would be implemented to ensure that impacts to biological resources are kept at a minimum. The amount of vegetation disturbed during construction activities would be kept to the minimum amount required. Disturbed areas would be re-established with native grasses. Additional erosion control measures, which would also minimize impacts to vegetation, are discussed in Sections 4.1, 4.2, and 4.3. Impacts to vegetation would not be significant.

Consideration should be given to enhanced control of field bindweed and Canada thistle occurring near the North and West Gates before grading for construction is commenced to avoid spreading these weeds by ground disturbance. Although sites would be revegetated with grasses, which would help to control weed growth, additional measures to control weeds may be needed. Noxious weeds on areas disturbed by the Proposed Actions would likely persist on-site after construction is finished. The grounds maintenance personnel would continue to manage noxious weeds by timely mowing, spraying, and pulling of the weeds by hand. With the continued rigorous management of noxious weeds practiced on base, impacts from construction of the Proposed Action is not expected to have a significant impact on the spread of noxious weeds.

Tallgrass prairie habitats have been reduced in El Paso County as a result of conversion to cropland and urban development (see Section 4.10 for cumulative impacts). The remaining patches of habitat in the project area have smaller core areas, which might influence the survival and reproduction of species living there. Although Peterson AFB and the Colorado Springs Municipal Airport have been identified as part of a potential conservation area by the Colorado Natural Heritage Program, the areas impacted by the Proposed Action have been rated as poor quality due to previous disturbance and development. A small area (less than one acre) of northern sandhill prairie community (rated as poor quality) on Peterson East would not be impacted by the Proposed Action. The most extensive area of tallgrass prairie is located about two miles south of the Proposed Action and would not be affected. Impacts to the tallgrass prairie from the Proposed Action would not be significant.

A small area of vegetation (less than one acre) would be disturbed during construction of the proposed bridge over the East Branch of Sand Creek. The area would be revegetated after construction. The USFWS recommends using small riprap and willows to stabilize the stream bank (USFWS, 2004a). A minimum of 50 feet of upland buffer along revegetated channels is encouraged. Impacts to vegetation along the stream would not be significant.

Wildlife. Wildlife such as pocket gophers, eastern cottontails, deer mice, and bull snakes would be displaced as part of the action. Impacts to these species are not considered significant due to the mobility of these species to seek similar habitat in the surrounding area. Once the facility is constructed, the contractor would be required by the grading permit to revegetate the open areas. The wildlife species previously displaced would readily return to the area. No long-term impact to wildlife would occur.

Colonies of cliff swallows (*Hirundo pyrrhonota*) nesting on the existing bridge over the East Branch of Sand Creek could be disturbed during construction of the proposed bridge (swallows are approximately 100 feet to the north). Best management practices suggested by the USFWS include starting construction before nesting season begins in April. If the swallows scout the area and can tolerate the on-going construction activity and nest anyway, then impacts from construction would be minimal (as opposed to starting the project in the middle of nesting season, causing them to abandon their nest from the sudden increase in activity). The possibility of using a visual barrier between the colonies and the construction should be considered (USFWS, 2004b). Caution should be used when considering a visual barrier, as netting or curtains often discourages swallows from returning to their nests (Gorenzel and Salmon, 1994).

Threatened or Endangered Species. The proposed project area does not include optimal habitat for any of the transient Federal- or state-listed species that may occur in El Paso County. As noted in Section 3.4.3, no threatened or endangered species are known to occur in the project area, so no significant impacts to these species would occur.

4.4.3 Potential Impacts of the West Gate Alternative

Impacts would be similar to the Proposed Action and would not be significant.

4.4.4 Potential Impacts of the Northeast Gate Alternatives

Option 2 would disturb about ½ acre more than the Proposed Action. Options 3 and 4 would each disturb about 2 acres more than the Proposed Action. The additional land disturbed for all of these options is relatively undisturbed grassland (but rated poor as potential natural habitat) (CNHP, 1997). Impacts from these Alternatives would not be significant. Impacts from other projects would be the same as the Proposed Action and would not be significant.

4.4.5 Potential Impacts of the No Action Alternative

For the No Action Alternative, current conditions in the project area would not change and no impacts would occur.

4.4.6 Mitigation Measures

As discussed in section 4.3, the Proposed Action would be subject to permits which include mandatory practices to control and reduce erosion and to reestablish vegetation in disturbed areas. No potentially significant impacts to biological resources were identified. No mitigation measures are necessary. Best management practices should be implemented to avoid impacts to the cliff swallows on the existing bridge over the East Branch of Sand Creek.

4.5 CULTURAL RESOURCES

Cultural resources are limited, nonrenewable resources whose values may easily be diminished by physical disturbances. There are no known cultural resources within the areas proposed for security or traffic upgrades. Construction activities would occur at previously disturbed or surveyed areas where the potential to discover intact archaeological resources is low. Impacts from the Alternatives would be the same as those under the Proposed Action. If no action is taken, there would be no impacts to archaeological resources.

4.5.1 Analysis Methods

To determine potential impacts, the analysis focused on the types of activities that would occur and their location, and the significance of the resource in that location. The Colorado Historical Society Historic Building Inventory Records (USAF, 1996), the Cultural Resource Management Plan (USAF, 1998), past archaeological surveys conducted on Peterson AFB and in the surrounding area, and previous NEPA documents were reviewed to provide data on existing cultural resources on the base and adjacent property.

4.5.2 Potential Impacts of the Proposed Action

Based on past surveys of the project areas and surrounding areas the proposed sites are considered low probability for discovering intact archaeological resources. No known cultural resources have been identified in the areas proposed for construction. An archaeological survey would be conducted on the four acre parcel the Air Force is proposing to acquire near the West Gate.

Should unknown archaeological resources be uncovered during construction activities, the Air Force would follow procedures described in AFI 32-7065, *Cultural Resource Management*, for coordination with the Colorado State Historic Preservation Officer and Advisory Council on Historic Preservation.

4.5.3 Potential Impacts of the West Gate Alternative

Impacts from this alternative would be similar to those under the Proposed Action. Four acres of land proposed for acquisition as part of this Alternative would be surveyed prior to the start of construction. Should unknown archaeological resources be uncovered during construction activities, the Air Force would follow procedures described in AFI 32-7065, *Cultural Resource Management*, for coordination with the Colorado State Historic Preservation Officer and Advisory Council on Historic Preservation.

4.5.4 Potential Impacts of the Northeast Gate Alternatives

Any off-base land acquired near the North East Gate would be surveyed prior to the start of construction. Should unknown archaeological resources be uncovered during construction activities, the Air Force would follow procedures described in AFI 32-7065, *Cultural Resource Management*, for coordination with the Colorado State Historic Preservation Officer and Advisory Council on Historic Preservation.

4.5.5 Potential Impacts of the No Action Alternative

For the No Action Alternative, the security and traffic upgrades would not be implemented and no impacts to cultural resources would occur.

4.5.6 Mitigation Measures

No significant impacts to cultural resources have been identified; therefore, no mitigation measures are necessary.

4.6 NOISE

The impacts on the noise environment are related to the magnitude and duration of the noise levels generated during construction and the proximity of noise-sensitive receptors to the noise source. Construction equipment and traffic associated with the Proposed Action or Alternatives would not significantly influence the noise environment because the noise generated would be below significance thresholds and would be intermittent and occur during daytime hours. There would be no changes in noise levels under the No Action Alternative.

4.6.1 Analysis Methods

The analysis of noise impacts was based on the assessment of the estimated noise levels generated from the Proposed Action and Alternatives and a comparison with ambient noise levels. The analysis was also based on identifying any sensitive receptors near the proposed or alternative building sites. Maps of Peterson AFB and the surrounding area were used to determine the locations of sensitive receptors.

4.6.2 Potential Impacts of the Proposed Action

Construction activity would occur intermittently several months at a time for several years at various locations on base. Impacts to nearby receptors during the day are normally assessed using the equivalent sound level averaged over eight hours ($L_{eq\ (8)}$). In general, construction activity would be limited to daytime weekday hours. Given the types of equipment likely to be used in constructing the roads and facilities (e.g., bulldozers, dump trucks, etc.), and the noise levels of the equipment (see Table 3.6-2), typical noise emissions at 50 feet from multiple pieces of construction equipment would be approximately 90 dBA (U.S. Army, 1978). Assuming a usage factor of 50 percent (on average, any piece of equipment would be used at a maximum operating capacity 50 percent of the time), noise averaged over 8 hours would be about 88.5 dBA at 50 feet; noise averaged over 24 hours would be about 82 dBA at 50 feet. Noise exposure levels would attenuate about 6 dB for every doubling of distance (assuming flat terrain and no trees or buildings). Within buildings, the noise levels would be attenuated by an additional 20 to 25 dBA.

Table 4.6-1 shows estimated noise levels generated by the Proposed Action at noise sensitive receptors on and off Peterson AFB. These noise impacts would affect locations for several months and would be intermittent throughout the day. Most of the noise sensitive receptors impacted would be on Peterson AFB. Two off-base residential areas would be impacted by Actions near the North and West Gates. The estimated noise (on and off-base) would not exceed levels which could potential cause hearing loss. Some residents of base housing could be annoyed by noise levels of about 82 dBA (outside levels averaged over eight hours) or an estimated 56 dBA inside averaged over 24 hours from realigning Stewart Avenue and Mitchell Street. While this noise would be slightly over the level which can cause annoyance, it would be short-term and limited to daytime hours, and residents of base housing are accustomed to aircraft noise from the runway to the east. Noise from the Proposed Action would be short-term and the impacts would not be significant. Long-term noise levels would be unchanged from current background noise levels.

The construction contractor would ensure that Air Force personnel are protected from excessive noise exposure and all equipment utilized by the construction contractor that produces noise levels in excess of 84 dBA would be identified by the contractor. Occupational noise exposure to workers would be kept below the Occupational Safety and Health Administration standard of 85 $L_{eq\ (8)}$, averaged over eight hours.

The project areas are near the boundary of Peterson AFB and the surrounding community. As discussed in Section 3.6, potential annoyance to nearby communities is normally measured by the equivalent sound level averaged over 24 hours ($L_{eq\ (24)}$). Much of the off-base area near the North and West Gates is open space, commercial (Space Village) or industrial (the Cherokee Water District tank and lagoons) near the East Fork of Sand Creek. The Space Village commercial area would experience noise levels of about 58 $L_{eq\ (24)}$. A residential area located about 1,600 feet to the north and northwest of the project area would experience outdoor noise exposures around 50 $L_{eq\ (24)}$. The noise would be further attenuated by the slopes up to U.S. Highway 24, between the project area and the residential area. A residential area west of Powers Boulevard near Airport Road would experience average noise levels of about50 $L_{eq\ (24)}$. The off-base noise exposure levels would be well below the 75 $L_{eq\ (8)}$ threshold for potential hearing loss and below the threshold for community annoyance (see Section 3.6). None of these noise levels would be significant in terms of annoyance or hearing impacts.

Table 4.6-1 Noise Sensitive Receptors Impacted by the Proposed Action[1]					
Project	**Sensitive Receptor**	**Distance (feet)**	**Peak noise (dBA)**	**Average noise 8 hours**	**Average noise 24 hours**
East Gate (2005)	Base housing	4,800	57	50	43
West Gate (2006)	CDC Auditorium Youth Center Chapel Child care Offbase residential[2]	1,070 1,600 1,700 1,750 2,000 4,000	64 60 60 60 59 53	62.5 58.5 58.5 58.5 57.5 51.5	56 52 52 52 51 50
North Gate (date undetermined)	CDC Offbase residential[3]	1,500 1,800	60 60	58.5 58.5	52 52
Northeast Gate (date undetermined)	Base housing CDC	1,900 2,800	59 55	57.5 53.5	51 47
Extend Paine Street (2006 or 2007)	Base housing CDC	200 2,300	78 57	76.5 55.5	70 49
Realign Stewart and Mitchell (date undetermined)	Base housing Child care Clinic Chapel Youth Center Auditorium	100 1,050 1,100 1,200 1,350 1,500	84 64 64 63 62 61	82.5 62.5 62.5 61.5 60.5 59.5	76 56 56 55 54 53
Widen Stewart Ave (date undetermined)	Base housing Child care Youth center Chapel Clinic	600 2,500 2,500 2,800 2,800	69 57 57 55 55	67.5 55.5 55.5 53.5 53.5	61 49 49 47 47

[1] Noise levels are estimated using USACE methodologies for sources and average attenuation with flat terrain and no trees or buildings. Noise levels are estimated for outside of buildings. Buildings normally attenuate noise by 20 to 30 dBA.

[2] Located west of Powers Boulevard near Airport Road

[3] Located north of U.S. Highway 24, west of Peterson Road

CDC = Child Development Center (Building 1350)

4.6.3 Potential Impacts of the West Gate Alternative

Impacts from the West Gate Alternative would be similar to those under the Proposed Action. Noise generated would be short-term and intermittent during normal daytime hours. Distances to sensitive receptors would be the same and the noise generated by construction equipment would be essentially the same. Short-term impacts would not be significant. Long-term noise would remain the same, similar to the Proposed Action.

4.6.4 Potential Impacts of the Northeast Gate Alternative

Impacts from the Northeast Gate Alternative would be similar to those under the Proposed Action. Noise generated would be short-term and intermittent during normal daytime hours. Distances to sensitive receptors would be greater than under the Proposed Action and the noise generated by construction equipment would be slightly less. No off-base sensitive receptors would be affected. Short-term impacts would not be significant. Long-term noise would remain the same, similar to the Proposed Action.

4.6.5 Potential Impacts of the No Action Alternative

No impacts would occur from the No Action Alternative; noise levels would remain at current levels.

4.6.6 Mitigation Measures

No significant impacts to noise levels have been identified; therefore, no mitigation measures are required.

4.7 ENVIRONMENTAL JUSTICE

Activities related to the Proposed Action were evaluated to determine if they would disproportionately impact a minority population, low-income population, or children. None of the impacts from construction or operation of the proposed facilities would be significant, and they would not disproportionately impact a minority population, low-income population, or children. No significant environmental justice impacts were identified from the Proposed Action, West Gate or Northeast Gate Alternatives, or No Action Alternative.

4.7.1 Analysis Methods

Measures used for impact analysis include demographic and income data obtained from the 2000 U.S. Census (USBC, 2002); these data were used to locate minority populations and low-income populations within one mile of the project area. The composition of the population in this area was compared to the population of El Paso County and the State of Colorado to determine if there is a potential for disproportionate impacts to minorities, children, or residents living on incomes below the poverty level.

4.7.2 Potential Impacts of the Proposed Action

The Proposed Action would result in increased emissions of criteria pollutants and noise generated by construction equipment. None of these impacts would be significant. Proposed Actions on Peterson East would take place in a sparsely populated area. According to the 2000 U.S. Census, there are about 25 residents within census blocks located within one mile of the project sites. About 1,200 people reside within a mile of the West Gate, but no one resides within 0.7 miles. The percentages of blacks and those identified as two or more races are slightly higher than the County average, but the percentages of all other minorities within this area are similar or lower than the average for El Paso County and the State of Colorado. The percentage of children near all three gates is similar to the county and state averages, and the majority of these live outside of a one-half mile radius from impacted areas (and none are closer than 0.3 miles). No disproportionate impacts to minority population, low-income population, or children would occur, and impacts to environmental justice would not be significant.

4.7.3 Potential Impacts of the West Gate Alternative

Impacts would be similar to the Proposed Action, with no disproportionate impacts to minority population, low-income populations, or children.

4.7.4 Potential Impacts of the Northeast Gate Alternatives

Impacts would be similar to the Proposed Action, with no disproportionate impacts to minority population, low-income populations, or children.

4.7.5 Potential Impacts of the No Action Alternative

Under the No Action Alternative, there would be no change regarding low-income population, minority populations, or children.

4.7.6 Mitigation Measures

No significant impacts have been identified; therefore, no mitigation measures are required.

4.8 TRANSPORTATION

Each gate and parts of the road network at Peterson AFB would be temporarily affected by the Proposed Action. Short-term, but not significant impacts would result primarily from temporary lane closures or detours during construction of force protection upgrades and transportation improvements. When the Proposed Action is completed, traffic flow at the West and North Gates and on Stewart Avenue would improve. Traffic flow to and from the Command Area of the base would also improve with construction of the Paine Street extension and the Northeast Gate. Impacts from the West Gate or Northeast Gate Alternatives would be similar to the Proposed Action. Taking no action would not change the transportation infrastructure.

4.8.1 Analysis Methods

The analysis is primarily concerned with assessing changes from existing road conditions and traffic flow as a result of implementing the Proposed Action or Alternative. Information on the traffic routes and existing traffic volumes and flow impacted were examined to predict the types and extent of impacts that would likely occur under each of the alternatives analyzed. Sources of information used in the analysis include the 1995 and 1999 Traffic Studies for Peterson AFB and the 1985 Highway Capacity Manual.

4.8.2 Potential Impacts of the Proposed Action

The proposed force protection upgrades and transportation system improvements would impact traffic at intersections and some base roads over a several year period. Temporary lane or road closures would disrupt traffic. These impacts would generally be limited to one location at a time and detours and alternate routes would be available. Impacts would be limited to surface transportation; flights at Peterson AFB and the Colorado Springs Municipal Airport would not be impacted.

East Gate. Entrance into this gate may need to be curtailed temporarily during widening of the access road and median, and installation of six vehicle barriers. The amount of traffic currently accessing Peterson AFB by this gate is relatively small (700 vehicles per day in the latest traffic counts). Construction of the vehicle and postal inspection facilities would minimally impact traffic. Impacts to traffic flow would not be significant from the proposed construction at the East Gate. Upon completion of the inspection facilities, the operating hours of the East Gate would be extended from two hours in the morning peak period to at least nine hours (7:30 a.m. to 4:30 p.m.). All truck traffic entering the base would be routed to the East Gate. This would improve traffic flow at the North and West Gates. Marksheffel Road is currently operating at an LOS of A and the access road to the East gate is currently operating at an LOS of A to B. After completion of the proposed BX and Commissary on Peterson East in 2006, much of the traffic accessing the base for these facilities will utilize the East Gate. Marksheffel Road has sufficient capacity to handle the additional traffic generated by trucks and planned development on Peterson East, and long-term impacts would not be significant. Short-term traffic increases could be handled on Stewart Avenue on Peterson East, but as this area further develops, improvements to Stewart Avenue would be needed.

West Gate. New gate facilities (a visitor center, a vehicle inspection facility, and a gatehouse) and a widened and realigned Stewart Avenue (see Figure 2.1-2) would be constructed at the West Gate in 2006 to improve traffic flow and provide security upgrades. A second bridge over the East Branch of Sand Creek would be constructed to provide increased capacity to access the base from Stewart Avenue. This project would take about 2 years to complete, and traffic would be restricted throughout the projected construction timeframe. Traffic entering the West Gate would become more congested due to lane restrictions and reduced speed through construction zones. Short-term impacts would be adverse, but not significant (the West Gate and Stewart Avenue are already at LOS F, the most congested level). Some traffic could be rerouted to the North and East Gates, but the North Gate is already exceeding capacity during rush hours and could not handle much additional traffic. Completion of the BX and Commissary on Peterson East (and closure of the current facilities near the West Gate) would ease the potential congestion slightly. Consideration should be given to constructing temporary detours or instituting traffic control measures to minimize delays accessing the base through the West Gate during this proposed construction. Completion of these proposed improvements would increase the capacity of the West Gate by more than 50 percent, potentially improving the LOS to a D or E. Construction of a vehicle inspection facility would improve security at the West Gate and slightly improve traffic flow by reducing delays resulting from vehicle inspections.

North Gate. Construction of a vehicle inspection facility would improve security at the North Gate and slightly improve traffic flow by reducing delays resulting from vehicle inspections. Construction of an extended entry road from the U.S. Highway 24 off ramps accessing Peterson Boulevard would improve access to the base and reduce the amount of traffic backing up onto the off ramps. Occasional lane closures or restrictions would be short-term and traffic flow would be minimally impacted.

Short-term impacts would not be significant. Long-term traffic flow would improve slightly.

Northeast Gate. Construction of a northeast gate allowing entrance to the base from Space Village Road would minimally impact traffic on Space Village Road and Patrick Street. Short-term impacts would not be significant. Completion of this gate would allow traffic to access the Command Area of Peterson AFB during duty hours. Current plans are to operate the two-lane access road in one direction. During the morning peak period, traffic flow would be restricted to entering the base and during the afternoon peak, traffic would be restricted to exiting. The gate would be open only during the peak commute periods during the morning and afternoon for a total of four hours each day. This new gate would alleviate traffic congestion during the morning and evening rush hours at the North and West Gates.

Extend Paine Street. Construction of an extension of Paine Street at the southeast of the Command Area to Stewart Avenue east of its intersection with Mitchell Street (see Figure 2.1-5) would have minor impacts on traffic flow along Paine Street and Stewart Avenue. Temporary lane restrictions during construction would constrict traffic flow, but not substantially. If necessary, traffic could follow alternate routes in the Command Area if congestion increases. Traffic flow in the vicinity of Stewart Avenue and Mitchell Street is estimated at an LOS of A for both morning and evening peak hours and would not change substantially during construction of the Paine Street extension. No alternate routes for traffic would be available, but short-term impacts to traffic flow would not be significant. Completion of the extension would provide a more direct route to the Command Area and allow traffic flowing from the East Gate to the Command Area to bypass the intersection of Peterson Boulevard and Stewart Avenue. This could somewhat improve the LOS at Peterson Boulevard and Stewart Avenue. This would also reduce traffic in the vicinity of the child development center, chapel, and auditorium.

Realign Stewart Avenue and Mitchell Street. This project is part of a plan to improve traffic flow between the main part of Peterson AFB and Peterson East (along with the extension of Paine Street (see above) and widening Stewart Ave from the extended Pine Street east and south to the southern extent of Peterson East). Construction of this realignment would disrupt traffic flow periodically for about one year. Traffic which normally flows east on Stewart Avenue and south on Mitchell Street could be diverted to Suffolk Street and east to Mitchell. Traffic flowing east on Stewart Avenue to Peterson East would be restricted, likely following temporary detours. Impacts would not be significant. Completion of this project would improve access to Peterson East, eliminating a potential source of congestion as Peterson East is developed in the future and traffic through this area begins to increase.

Widen Stewart Avenue. Construction of this project would disrupt traffic flow on Stewart Avenue from east of the proposed Paine Street extension to an area south of the East Gate. Lane restrictions or temporary detours would be in place for the majority of the construction timeframe. Impacts to traffic flow would not be significant. As Peterson East is developed in the future, long-term traffic flow would be maintained at efficient levels with a widened Stewart Avenue.

Trucks hauling construction equipment and supplies would occasionally increase traffic volume during construction of all proposed projects, but these impacts would be intermittent and not substantial. Impacts from construction vehicles would be short-term and not significant.

4.8.3 Potential Impacts of the West Gate Alternative

Impacts from constructing a single span bridge over the East Branch of Sand Creek would be similar to the Proposed Action and would not be significant.

4.8.4 Potential Impacts of the Northeast Gate Alternatives

Impacts from constructing access roads from various locations (see Section 2.2) would be similar to the Proposed Action and would not be significant. One alternative would impact Space Village Road further east than the Proposed Action, but any traffic restrictions during construction would be similar to those described under the Proposed Action.

Two of the alternative locations would access Marksheffel Road. Periodic temporary lane closures or restrictions on Marksheffel Road would not have a significant impact on traffic flow. However, Marksheffel Road is currently being reconstructed as a limited-access freeway and potential use of Marksheffel Road as an access point would need to be coordinated with the City of Colorado Springs and the Colorado Department of Transportation.

Long-term traffic flow impacts would be similar to those described under the Proposed Action.

4.8.5 Potential Impacts of the No Action Alternative

Under this alternative, the force protection upgrades and transportation improvements would not be constructed. There would be not be any impacts associated with construction, but the gates would not meet requirements for increased security under DoD Instruction 2000.16, AFI 31-101, and AFH 32-1084. Gates would not be able to operate under all force protection conditions. Additionally, potential traffic congestion would not improve by constructing transportation improvements. Traffic congestion would continue at the North and West Gates and along Peterson and Stewart Avenues. Long-term traffic flow would continue to deteriorate.

4.8.6 Mitigation Measures

No mitigation measures are required, as no significant impacts from implementing the Proposed Action or the Alternatives were identified. However, to ease potential traffic congestion, temporary detours or traffic control should be implemented as best management practices.

4.9 COMPATIBILITY OF THE PROPOSED ACTION WITH OBJECTIVES OF FEDERAL, STATE, AND LOCAL LAND USE PLANS, POLICIES, AND CONTROLS

The Proposed Action would be compatible with the existing Federal, state, and local land use plans, policies, and controls. The action is compatible with the Peterson AFB's master plan.

4.10 RELATIONSHIPS BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

The definitions of short-term and long-term are based on the scope of the Proposed Action. Short-term use of the environment, as it relates to the Proposed Action, would encompass the construction period. Long-term productivity is associated with the operation of the postal and vehicle inspection facilities. During construction, soil would be excavated and there would be associated noise and dust emissions. Excavation and construction would not have a significant environmental effect and impacts would be minimized through best management practices required for construction permits. Areas disturbed by construction would be regraded and revegetated to restore the stability and productivity of grassland areas, in accordance with the El Paso County grading permit. The proposed facilities and roads would have a long useful life and therefore, high long-term productivity.

4.11 CUMULATIVE IMPACTS

Cumulative impacts are those changes to the physical and biological environments that would result from the Alternatives in combination with reasonably foreseeable future actions. Significant cumulative impacts could result from impacts that are not significant individually, but when considered together, are collectively significant.

Development of the proposed force protection upgrades and transportation improvement projects would contribute to cumulative impacts related to military growth and development, traffic, traffic related noise levels, storm water runoff, air pollution, noise, and public services and utilities over a long period of time. Development of the sites would also result in a cumulative reduction in open space in the City. Development of the project represents a continuation of growth and development in El Paso County and the City of Colorado Springs. The Proposed Action would support a military requirement to improve the capability to protect personnel and assets under various threat conditions.

The Proposed Action would continue to comply with Federal and Colorado air quality laws and Air Force policies which are designed to minimize long-term cumulative impacts to air quality. The Proposed Action would conform with the Colorado Springs maintenance plan for CO. Short-term construction emissions would not violate state or Federal standards. Increases in long-term emissions would be minimal compared to existing emissions generated at Peterson AFB. Cumulative impacts to air quality would not be significant.

Remnants of tallgrass prairie occur in Colorado as disjunct populations from the historic tallgrass prairie that made up the eastern third of the Great Plains. Historically, tallgrass prairie occupied approximately 150 million acres, but today less than two percent of that remains (CNHP, 2001). Most tallgrass prairie has been converted to cropland or other uses. Very few large patches of tallgrass prairie remain in Colorado. The amount of vegetation disturbed at Peterson AFB during construction activities would be kept to the minimum amount required. The proposed actions would disturb about 11 acres of semi-improved land on Peterson East (a portion of which is considered potentially viable prairie area). About 6 acres would be paved or have buildings constructed on them. The most viable area of tallgrass prairie in the potential conservation area identified by the Colorado Natural Heritage Program is about two miles south of the areas impacted by the proposed action and would not be disturbed. Cumulative impacts would not be significant due to the limited area and condition of the existing grasslands.

The potential for storm water runoff would be increased by the Proposed Action and other foreseeable actions in the vicinity. Currently, approximately 33 acres on Peterson East are hard surfaces – pavement or building structures (about 13 percent). The Proposed Action would increase this by about 6 acres, and other developments, such as the proposed Arrival/Departure Air Control Group (A/DACG) Complex to the south of Bldg 2025 (which is south of the proposed BX and commissary), and security and transportation improvements, would add another 90 acres of impermeable surface. Impermeable surfaces would increase to about 42 percent of the total area of Peterson East. In the short-term, overland flow and percolation would be utilized to manage storm water runoff from the postal and vehicle inspection facilities, and the BX and commissary, increasing the risk of erosion and ponding from standing water. Over time, as development increases (from the BX and commissary, A/DACG, widening of Stewart Avenue, and other future development on Peterson East), storm water runoff from impermeable surfaces would increase and the extent of ponding would increase substantially. Various options are being considered for long-term management of storm water runoff from these impermeable surfaces. A storm water runoff study for Peterson East and the adjacent area for the proposed A/DACG Complex currently underway will provide a comprehensive solution to adequate storm water management to prevent potential accelerated erosion on steep slopes in the affected areas and additional ponding which increases the potential for attracting waterfowl. With an adequate storm water management system in place, cumulative impacts from storm water runoff would not be significant.

Short and long-term impacts to other resources (groundwater, cultural, and noise) would be minimal, and would not substantially contribute to cumulative impacts.

4.12 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The irreversible and irretrievable commitment of resources would most likely involve the commitment of concrete, steel, timber, brick, wood, paint, and topsoil. Operation of construction equipment would also involve the consumption of fossil fuels, while the completed facilities would require electricity and natural gas for heat and light.

None of these materials are considered rare and the long-term commitment of these resources would not have a substantial effect on their future availability.

The construction would require a temporary commitment of workers over a few consecutive years. This commitment is considered to be a beneficial impact to the construction industry.

CHAPTER 5

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5. REFERENCES

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CHAPTER 6

LIST OF PREPARERS

6. LIST OF PREPARERS AND CONTRIBUTORS

This EA has been prepared by the Air Force Center for Environmental Excellence and the 21st Civil Engineer Squadron at Peterson AFB with contractual assistance from LABAT-ANDERSON INCORPORATED (LABAT). The following personnel were involved in the preparation and review of this report:

Wesley R. Adkins, LABAT, Environmental Analyst
B.S., 2000, Forest Management, Iowa State University
Years of Experience: 4

Dean P. Converse, LABAT, Environmental Analyst
B.S., 1998, Geography – Environmental Studies, University of Nebraska at Lincoln
Years of Experience: 6

Quinn V. Damgaard, LABAT, Environmental Analyst
B.A., 2000, Environmental Biology, Augustana College, Sioux Falls, South Dakota
Years of Experience: 4

Carmen L. Hansen, LABAT, Executive Administrator
Years of Experience: 12

JoAnn M. Leonard, LABAT, Administrative Assistant
Years of Experience: 19

Mark A. Mann, 21 CES/CEV, Natural and Cultural Resources Program Manager
B.S., 1983, Natural Resource Management, University of Tennessee
Years of Experience: 21

Randall G. McCart, LABAT, Senior Environmental Analyst
B.S., 1981, Geography, University of Nebraska at Omaha
M.A., 1984, Geography, University of Nebraska at Omaha
B.S., 1987, Education, University of Nebraska at Omaha
Years of Experience: 16

Sheri A. Rivera, LABAT, Project Manager, Senior Environmental Analyst
B.S., 1989, Geography, University of Nebraska at Omaha
M.S., 1995, Urban Studies, University of Nebraska at Omaha
Years of Experience: 15

Susan M. Smillie, LABAT, Senior Environmental Analyst
M.En., 1981, Environmental Science, Miami University, Oxford, OH
B.S., 1978, Biology, Smith College, Northampton, MA
Years of Experience: 22

Kristin L. Sutherlin, LABAT-ANDERSON INCORPORATED, Senior Reviewer
B.A., 1986, Economics, Louisiana State University in Shreveport
M.A., 1988, Urban Studies, University of Maryland, College Park
Years of Experience: 14

APPENDIX A
PHOTOS

APPENDIX A — SITE PHOTOGRAPHS

This appendix contains photographs taken at Peterson AFB during a site visit that took place in October 2003.

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Photo 1 Looking East Toward the East Gate

Photo 2 Proposed Vehicle Inspection Site, Looking North from East Gate

Photo 3 Proposed Vehicle and Postal Inspection Sites, Looking Northeast from East Gate

Photo 4 Existing Bridge over East Branch of Sand Creek near West Gate

Photo 5   Closeup of Existing Stewart Ave Bridge near West Gate

Photo 6   West Bank of the East Branch of Sand Creek

Photo 7 East Branch of Sand Creek Just North of Stewart Ave Bridge

Photo 8 Outfall 1 at East Branch of Sand Creek Near West Gate

APPENDIX B
REGULATORY REVIEW

APPENDIX B — REGULATORY REVIEW

A brief summary of Federal and state laws and regulations that may be applicable to the Proposed Action or Alternatives is provided in the following paragraphs. Permits for Air Resources, Soils and Geology, and Water Resources are discussed in the associated resource sections of the EA.

Environmental Policy

The *National Environmental Policy Act* of 1969 [42 United States Code (U.S.C.) Sec. 4321, *et seq*.] establishes national policy, sets goals, and promotes efforts, which will prevent or eliminate damage to the environment and biosphere. The NEPA process is intended to help public officials make decisions that are based on an understanding of environmental consequences, and take actions that protect, restore, and enhance the environment. The process is also intended to provide information regarding the analyses of proposed major federal actions that may significantly affect the environment to the public. The President's CEQ regulations [40 CFR 1500-1508] implement the procedural provisions of NEPA.

32 CFR 989, *Environmental Impact Analysis Process (EIAP)*, implements the Air Force EIAP and provides procedures for environmental impact analysis.

Executive Order (EO) 11514, *Protection and Enhancement of Environmental Quality*, as amended by EO 11991, sets the policy for directing the Federal Government in providing leadership in protecting and enhancing the quality of the nation’s environment.

Department of Defense

DoD installations are required to implement antiterrorism/force protection construction standards and develop protective measures for DoD assets in accordance with: DoD Instruction 2000.16, *DoD Combating Terrorism Standards*, AFI 31-101, *The Air Force Installation Security Program*, and AFH 32-1084 *Facility Requirements*.

Installation Entry Control Facility Design Guide. This guide provides the basic guidelines for organizing, evaluating, planning, programming, and designing Entry Control Facilities (ECFs) for Air Force installations worldwide, including the design of new ECFs and major and minor renovation projects.

Air Quality

The *Clean Air Act* (CAA) [42 U.S.C. Sec. 7401, *et seq*., as amended] establishes as federal policy the protection and enhancement of the quality of the Nation’s air resources to protect human health and the environment. The CAA sets national primary and secondary ambient air quality standards as a framework for air pollution control.

The *Colorado Air Pollution Prevention and Control Act* [Article 7 of the Title 25, *Colorado Revised Statutes*, 1973, as amended] establishes provisions to achieve and maintain levels of air quality that will protect human health and safety, and to require the use of all available practicable methods to reduce, prevent, and control air pollution for the protection of the health, safety, and general welfare of the people of the State of Colorado.

Air Force Instruction (AFI) 32-7040, *Air Quality Compliance*, instructs the Air Force on compliance with the CAA, and federal, state, and local regulations.

Water Quality

The *Clean Water Act* (CWA) [33 U.S.C. Sec. 1251, *et seq*., as amended] establishes federal limits, through the National Pollution Discharge Elimination System (NPDES), on the amounts of specific pollutants that are discharged to surface waters in order to restore and maintain the chemical, physical, and biological integrity of the water. A NPDES permit, or modification to an existing permit, would be required for any change from the present parameters in the quality or quantity of wastewater discharge and/or storm water runoff.

AFI 32-7041, *Water Quality Compliance*, instructs the Air Force on how to assess, attain, and sustain compliance with the CWA and federal, state, and local environmental regulations.

The *Colorado Water Quality Control Act* [Title 25] establishes provisions for the control and prohibition of air and water pollution within the state. In addition, the Colorado Department of Public Health and Environment (CDPHE) is responsible for administering the permitting program created under the act. No stationary installation that is reasonably expected to be a source of water pollution may be operated, maintained, constructed, expanded, or modified without an appropriate permit issued by the department.

Wetlands

EO 11988, *Floodplain Management*, requires federal agencies to evaluate the potential effects of actions on floodplains and to avoid adverse floodplain impacts wherever possible.

EO 11990, *Protection of Wetlands*, requires federal agencies to take action to avoid, to the extent practicable, the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. The intent of EO 11990 is to avoid direct or indirect construction in wetlands if a feasible alternative is available. All federal and federally supported activities and projects must comply with EO 11990.

AFI 32-7064, *Integrated Natural Resource Management*, Section 3, provides the Air Force with guidance for no net loss of wetlands on Air Force installations.

Biological Resources

The *Endangered Species Act* (ESA) [16 U.S.C. Sec. 1531-1543] requires federal agencies that authorize, fund, or carry out actions to avoid jeopardizing the continued existence of threatened or endangered species and to avoid destroying or adversely modifying their critical habitat. Federal agencies must evaluate the effects of their actions on threatened or endangered species of fish, wildlife, and plants, and their critical habitats, and take steps to conserve and protect these species. All potentially adverse impacts to federally threatened and endangered species must be avoided or mitigated.

The *Migratory Bird Treaty Act* [16 U.S.C. Sec. 703-711] imposes substantive obligations on federal agencies to protect migratory birds and their habitats.

AFI 32-7064, *Integrated Natural Resource Management*, provides the Air Force with guidance on compliance with the ESA and federal, state, and local environmental regulations.

Cultural Resources

The *National Historic Preservation Act* (NHPA) of 1966 [16 U.S.C. Sec. 470, *et seq*., as amended] requires federal agencies to determine the effect of their actions on cultural resources and take certain steps to ensure these resources are located, identified, evaluated, and preserved.

The *Archaeological Resources Protection Act* (ARPA) [16 U.S.C. Sec. 470a-11, as amended] protects archeological resources on federal lands. If archaeological resources are discovered that may be disturbed during site activities, the Act requires permits for excavating and removing the resource.

AFI 32-7065, *Cultural Resource Management*, provides the Air Force with guidance on compliance with the NHPA, ARPA, and applicable federal, state, and local regulations.

Noise

The *Noise Control Act* of 1972 [42 U.S.C. Section 4901 et seq., Public Law 92-574] establishes a policy to promote an environment free from noise harmful to the health or welfare of people. Federal agencies must also comply with state and local requirements for the control an abatement of environmental noise.

Public Health and Safety

The Installation Restoration Program (IRP) is a DoD program designed to identify, confirm, quantify, and remediate suspected problems associated with past hazardous material disposal sites on DoD installations. The Defense Environmental Restoration Program [10 U.S.C. Sec. 2701, *et seq*.] is the legal mandate for the IRP.

FAA Advisory Circular 150/5200-33, *Hazardous Wildlife Attractants on or Near Airports*, provides guidance on locating certain land uses having the potential to attract hazardous wildlife to or in the vicinity of public-use airports. It also provides guidance concerning the placement of new airport development projects pertaining to aircraft movement in the vicinity of hazardous wildlife attractants.

Environmental Justice

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations*, directs federal agencies to identify and address any disproportionately high and adverse human or environmental impacts of federal actions on minority or low-income populations.

Environmental Justice also takes into consideration EO 13045, Protection of Children from *Environmental Health Risks and Safety Risks*, which was signed by the President on April 21, 1997. This EO requires that each federal agency identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on children, who are more at risk because of developing body systems, comparatively higher consumption-to-weight ratios, behaviors that may expose them to more risks and hazards than adults, and less ability than adults to protect themselves from harm.

APPENDIX C
AIR EMISSION CALCULATIONS

APPENDIX C —
AIR EMISSION CALCULATIONS

This section includes the calculations performed for estimating air emissions generated from activities related to the Proposed Action and Siting Alternative. Emissions were estimated using emission factors from AP-42 (USEPA, 2004, 2003a, 2001a, 2001b, 2000a, 2000b, 1998a, 1998b, 1997, 1995a, and 1995b) and the Nonroad Engine Modeling (USEPA, 2002).

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Table C-1
Summary of Estimated Emissions from Construction and Operation of Proposed Improvements

Summary of Emissions in Tons Per Year by Source

Summary of emissions CY 2004						
Source	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Construction East Gate	1.96	0.27	3.48	0.57	0.81	0.07
Total	**1.96**	**0.27**	**3.48**	**0.57**	**0.81**	**0.07**
Summary of emissions CY 2005						
Source	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Operation East Gate Facilities	0.04	0.00	0.05	0.00	0.00	0.00
Total	**0.04**	**0.00**	**0.05**	**0.00**	**0.00**	**0.00**
Summary of emissions CY 2006						
Source	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Construction West Gate	6.60	0.64	9.75	1.58	3.04	0.16
Construction Extend Paine St	3.05	0.26	4.09	0.66	1.23	0.06
Operations East Gate facilities	0.04	0.00	0.05	0.00	0.00	0.00
Total	**9.68**	**0.90**	**13.89**	**2.23**	**4.27**	**0.22**
Summary of emissions CY 2007						
Source	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Construction West Gate (completion)	6.60	0.64	9.75	1.58	3.04	0.16
Construction Extend Paine St (completion)	3.05	0.26	4.09	0.66	1.23	0.06
Operations East Gate facilities	0.04	0.00	0.05	0.00	0.00	0.00
Total	**9.68**	**0.90**	**13.89**	**2.23**	**4.27**	**0.22**

Summary of Stationary Sources

2004	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Construction- Batch Mix Asphalt Plant	0.53	0.01	0.03	0.01	0.04	0.00
Construction-Fugitive Dust					0.54	
Total	**0.53**	**0.01**	**0.03**	**0.01**	**0.58**	**0.00**
Existing Stationary Sources	17.98	48.94	24.48	0.35	10.52	4.54
Total with Proposed Action	**18.51**	**48.95**	**24.51**	**0.36**	**11.10**	**4.54**
2005	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Operations East Gate facilities	0.04	0.00	0.05	0.00	0.00	0.00
Total	**0.04**	**0.00**	**0.05**	**0.00**	**0.00**	**0.00**
Existing Stationary Sources	17.98	48.94	24.48	0.35	10.52	4.54
Total with Proposed Action	**18.02**	**48.94**	**24.53**	**0.35**	**10.52**	**4.54**

2006	CO	VOC	NOx	SOx	PM-10	HAPs
Construction- Batch Mix Asphalt Plant[1]	2.65	0.05	0.17	0.03	0.18	0.00
Construction- Batch Mix Asphalt Plant[2]	1.26	0.03	0.08	0.01	0.08	0.00
Construction-Fugitive Dust[1]					2.32	
Construction-Fugitive Dust[2]					0.93	
Operations East Gate facilities	0.04	0.00	0.05	0.00	0.00	0.00
Total	**3.95**	**0.08**	**0.29**	**0.05**	**3.51**	**0.00**
Existing Stationary Sources	17.98	48.94	24.48	0.35	10.52	4.54
Total with Proposed Action	**21.93**	**49.02**	**24.77**	**0.40**	**14.03**	**4.54**
2007	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Construction- Batch Mix Asphalt Plant[1]	2.65	0.05	0.17	0.03	0.18	0.00
Construction- Batch Mix Asphalt Plant[2]	1.26	0.03	0.08	0.01	0.08	0.00
Construction-Fugitive Dust[1]					2.32	
Construction-Fugitive Dust[2]					0.93	
Operations East Gate facilities	0.04	0.00	0.05	0.00	0.00	0.00
Total	**3.95**	**0.08**	**0.29**	**0.05**	**3.51**	**0.00**
Existing Stationary Sources	17.98	48.94	24.48	0.35	10.52	4.54
Total with Proposed Action	**21.93**	**49.02**	**24.77**	**0.40**	**14.03**	**4.54**

[1] West Gate Construction

[2] Extend Paine Street Construction

Table C-2 Estimated Air Emissions from Construction and Operation

Emissions Years - CY04 -06 and Future Years

This table includes calculations performed for estimating air emissions generated from activities related
to the construction of security upgrades and road improvements at Peterson AFB.
Construction would be completed in several phases (detailed below)
Emissions were estimated using emission factors from AP-42 (USEPA, 1995-2003) and
Exhaust and Crankcase Emission Factors for Non Road Engine Modeling (USEPA, 2002)

Summary (emissions in tons per year CY 2004) (East Gate)

CO	VOC	NOx	SOx	PM-10	HAPs
1.96	0.27	3.48	0.57	0.81	0.07

Summary (emissions in tons per day CY 2004) (East Gate)

CO	VOC	NOx	SOx	PM-10	HAPs
0.01	0.00	0.02	0.00	0.00	0.00

Summary (emissions in tons per year CY 2006) (West Gate)

CO	VOC	NOx	SOx	PM-10	HAPs
6.60	0.64	9.75	1.58	3.04	0.16

Summary (emissions in tons per day CY 2006) (West Gate)

CO	VOC	NOx	SOx	PM-10	HAPs
0.02	0.00	0.04	0.01	0.01	0.00

Summary (emissions in tons per year CY 2007) (West Gate)

CO	VOC	NOx	SOx	PM-10	HAPs
6.60	0.64	9.75	1.58	3.04	0.16

Summary (emissions in tons per day CY 2007) (West Gate)

CO	VOC	NOx	SOx	PM-10	HAPs
0.02	0.00	0.04	0.01	0.01	0.00

Summary (emissions in tons per year CY 2006) (Extend Paine St)

CO	VOC	NOx	SOx	PM-10	HAPs
3.05	0.26	4.09	0.66	1.23	0.06

Summary (emissions in tons per day CY 2006) (Extend Paine St)

CO	VOC	NOx	SOx	PM-10	HAPs
0.02	0.00	0.02	0.00	0.01	0.00

Summary (emissions in tons per year CY 2007) (Extend Paine St)

CO	VOC	NOx	SOx	PM-10	HAPs
3.05	0.26	4.09	0.66	1.23	0.06

Summary (emissions in tons per day CY 2007) (Extend Paine St)

CO	VOC	NOx	SOx	PM-10	HAPs
0.02	0.00	0.02	0.00	0.01	0.00

Summary (emissions in tons per year Year 1) (North Gate)					
CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
1.98	**0.21**	**2.96**	**0.48**	**0.95**	**0.05**
Summary (emissions in tons per day Year 1) (North Gate)					
CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
0.01	**0.00**	**0.02**	**0.00**	**0.01**	**0.00**
Summary (emissions in tons per year Year 2) (North Gate)					
CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
1.98	**0.21**	**2.96**	**0.48**	**0.95**	**0.05**
Summary (emissions in tons per day Year 2) (North Gate)					
CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
0.01	**0.00**	**0.02**	**0.00**	**0.01**	**0.00**
Summary (emissions in tons per year Year 1) (Northeast Gate)					
CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
2.67	**0.30**	**4.19**	**0.68**	**1.29**	**0.07**
Summary (emissions in tons per day Year 1) (Northeast Gate)					
CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
0.01	**0.00**	**0.02**	**0.00**	**0.00**	**0.00**
Summary (emissions in tons per year Year 1) (Widen Stewart Ave)					
CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
3.98	**0.42**	**6.63**	**1.07**	**1.86**	**0.11**
Summary (emissions in tons per day Year 1) (Widen Stewart Ave)					
CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
0.01	**0.00**	**0.02**	**0.00**	**0.01**	**0.00**
Summary (emissions in tons per year Year 2) (Widen Stewart Ave)					
CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
3.98	**0.42**	**6.63**	**1.07**	**1.86**	**0.11**
Summary (emissions in tons per day Year 2) (Widen Stewart Ave)					
CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
0.01	**0.00**	**0.02**	**0.00**	**0.01**	**0.00**
Summary (emissions in tons per year Year 1) (Realign Stewart Ave and Mitchell)					
CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
3.50	**0.39**	**5.91**	**0.95**	**1.73**	**0.10**
Summary (emissions in tons per day Year 1) (Realign Stewart Ave and Mitchell)					
CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
0.01	**0.00**	**0.02**	**0.00**	**0.01**	**0.00**

Summary (emissions in tons per year Year 2) (Realign Stewart Ave and Mitchell)

CO	VOC	NOx	SOx	PM-10	HAPs
3.50	**0.39**	**5.91**	**0.95**	**1.73**	**0.10**

Summary (emissions in tons per day Year 2) (Widen Stewart Ave and Mitchell)

CO	VOC	NOx	SOx	PM-10	HAPs
0.01	**0.00**	**0.02**	**0.00**	**0.01**	**0.00**

East Gate Upgrades (2004)

Construct vehicle and postal inspection facilities, security features at gate
Estimated six months to construct (125 work days)
Includes grading, construction of two buildings, and paving access road and turnaround areas
Includes excavation and improvements at gate, and storm water drainage

Grading

PM_{10} emissions (fugitive dust) from grading

$PM = \frac{1.0*s^{1.5}}{M^{1.4}}$		6.103	lb/hr PM	160	hours
		4.58	lbs/hr PM_{10}	732.4	lbs PM_{10}
				0.37	**tons PM_{10}**
where s = silt (%), M = moisture (%)					
PM_{10} = PM * 0.75					

Sandy loam and loamy sand are typically 10-20 percent silt, an average of 15 percent was used.
5 percent soil moisture was assumed.
Sources: AP-42 Vol I, Chapter 13.2.3 Heavy Construction Operations, January 1995
AP-42 Vol I, Chapter 11.9 Western Surface Coal Mining, October 1998

Area to be graded	2.25	acres

Construction Equipment Operation

Grading and Excavating

Equipment	**Days**	**Hours/day**	**Pieces**	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Scraper	20	8	2	*593.28*	*62.29*	*1690.85*	*266.98*	*74.16*
Emissions (grams)				189849.6	19934.2	541071.4	85432.3	23731.2
Emissions (lbs)				418.17	43.91	1191.79	188.18	52.27
Bulldozer	20	8	2	*114.06*	*30.02*	*459.67*	*79.76*	*29.16*
Emissions (grams)				36499.5	9605.1	147095.6	25522.2	9330.7
Emissions (lbs)				80.40	21.16	324.00	56.22	20.55
Grader	20	8	1	*164.11*	*46.07*	*760.11*	*125.25*	*44.63*
Emissions (grams)				26258.3	7370.8	121617.4	20039.2	7140.4
Emissions (lbs)				57.84	16.24	267.88	44.14	15.73
Roller	10	8	2	*101.29*	*26.66*	*408.22*	*76.16*	*25.89*
Emissions (grams)				16206.8	4265.0	65314.8	12185.6	4143.1
Emissions (lbs)				35.70	9.39	143.87	26.84	9.13
Backhoe/loader	15	8	3	*277.55*	*54.78*	*282.12*	*38.80*	*42.45*
Emissions (grams)				99918.72	19720.80	101562.12	13968.90	15283.62
Emissions (lbs)				220.09	43.44	223.71	30.77	33.66
Total Emissions	lbs			812.19	134.13	2151.24	346.14	131.34
	tons			**0.41**	**0.07**	**1.08**	**0.17**	**0.07**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)

Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources

Paving

Equipment	Days	Hours/day	Pieces	CO	VOC	NOx	SOx	PM-10
Paving Equipment	4	8	4	*102.21*	*26.90*	*411.92*	*69.17*	*26.13*
Emissions (grams)				13082.9	3442.9	52725.2	8853.1	3344.5
Emissions (lbs)				28.82	7.58	116.13	19.50	7.37
Asphalt Paver	4	8	4	*154.86*	*23.10*	*226.73*	*39.79*	*24.81*
Emissions (grams)				19822.5	2957.0	29022.0	5092.5	3176.0
Emissions (lbs)				43.66	6.51	63.93	11.22	7.00
Dump Truck	4	8	12	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*
Emissions (grams)				188674.6	19810.8	537722.5	83960.2	23584.3
Emissions (lbs)				415.58	43.64	1184.41	184.93	51.95
Roller	4	8	4	*101.29*	*26.66*	*408.22*	*76.16*	*25.89*
Emissions (grams)				12965.5	3412.0	52251.9	9748.5	3314.5
Emissions (lbs)				28.56	7.52	115.09	21.47	7.30
Total Emissions	lbs			516.62	65.25	1479.56	237.12	73.61
	tons			**0.26**	**0.03**	**0.74**	**0.12**	**0.04**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources
Asphalt paving assumes standard 10 inch thickness for heavy duty road, 2 tons per cubic yard. Assumes 10 mile round trip for dump trucks (15 ton trucks). Assumes 2 hour round trip for loading, transporting and unloading

Building Construction

	Days	Hours/day	Pieces	CO	VOC	NOx	SOx	PM-10
Crane	40	6	2	*73.85*	*30.53*	*549.46*	*91.58*	*24.62*
Emissions (grams)				35449.20	14652.34	263742.05	43957.01	11816.40
Emissions (lbs)				78.08	32.27	580.93	96.82	26.03
Generators	75	8	2	*56.17*	*39.32*	*387.55*	*66.84*	*40.44*
Emissions (grams)				67399.20	47179.44	465054.48	80205.05	48527.42
Emissions (lbs)				148.46	103.92	1024.35	176.66	106.89
Air Compressors	75	8	2	*33.70*	*23.59*	*232.50*	*40.10*	*24.26*
Emissions (grams)				40435.20	28304.64	279002.88	48117.89	29113.34
Emissions (lbs)				89.06	62.35	614.54	105.99	64.13
Concrete Truck	2	8	10	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*
Emissions (grams)				78614.4	8254.5	224051.0	34983.4	9826.8
Emissions (lbs)				173.16	18.18	493.50	77.06	21.64
Total Emissions	lbs			488.76	216.72	2713.33	456.53	218.69
	tons			**0.24**	**0.11**	**1.36**	**0.23**	**0.11**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources

Concrete trucks for building floors. Assumes 1 foot thick floor. Assumes 9 cubic yard load for each concrete truck, with a 2 hour round trip.

Relocating Utilities

Equipment	**Days**	**Hours/day**	**Pieces**	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Backhoe/loader	10	8	3	*277.55*	*54.78*	*282.12*	*38.80*	*42.45*
Emissions (grams)				66612.48	13147.20	67708.08	9312.60	10189.08
Emissions (lbs)				146.72	28.96	149.14	20.51	22.44
Bulldozer	10	8	3	*114.06*	*30.02*	*459.67*	*79.76*	*29.16*
Emissions (grams)				27374.6	7203.8	110321.7	19141.6	6998.0
Emissions (lbs)				60.30	15.87	243.00	42.16	15.41
Crane	10	6	1	*73.85*	*30.53*	*549.46*	*91.58*	*24.62*
Emissions (grams)				4431.15	1831.54	32967.76	5494.63	1477.05
Emissions (lbs)				9.76	4.03	72.62	12.10	3.25
Total Emissions	lbs			216.78	48.86	464.75	74.78	41.11
	tons			**0.11**	**0.02**	**0.23**	**0.04**	**0.02**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources

Estimated Emissions from Highway Trucks

Water truck								
Exhaust emissions				**CO**	**HC**	**NOx**	**SOx**	**PM-10**
Number of trucks	1		EF (g/mi)	18.8	4.7	8.2	0.512	0.124
Distance (miles)	10		lbs/mi	0.0414	0.0104	0.0181	0.0011	0.0003
Days	125		Amt (lbs)	51.76	12.94	22.58	1.41	0.341
Total Miles	1,250		**Amt (tons)**	**0.03**	**0.01**	**0.01**	**0.00**	**0.000**

VOC, CO, and Nox emission factors from AP-42 Vol II Appedix H, Table 7.11 A.2, calendar year 2003, model year 1995
SOx and PM10 emission factors from AFIERA Table 4-50 (USAF, 2002)
All emission factors for high altitude (greater than 4,000 feet)

Total Construction Equipment Emissions

East Gate				**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
			lbs	2086.11	477.90	6831.46	1115.98	465.09
			tons	**1.04**	**0.24**	**3.42**	**0.56**	**0.23**

Hazardous Air Pollutants from Construction Equipment

Total HAPs		142.56	lbs
		0.07	**tons**

Total HAPs calculated from emission factors in Table 7.10 USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources

Worker Vehicle Trips								
Exhaust				**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Number of workers	20		EF (g/mi)	9.387	0.598	0.655	0.072	0.011
Commute (miles)	15		lbs/mi	0.0206762 1	0.0013171 8	0.001442731	0.0001586	2.423E-05
Days	125		Amt (lbs)	775.36	49.39	54.10	5.95	0.909
Total Miles	37,500		**Amt (tons)**	**0.39**	**0.02**	**0.03**	**0.00**	**0.000**

EF = Emission Factor for calendar year 2000 in grams per mile
Emission factor from AP-42 Vol II Appendix H Highway Mobile Source Emission Factor Tables
Assumes average vehicle model year of 1995 for high altitude light duty gas powered vehicles with 50,000 miles
SOx and PM10 emission factors from AFIERA Table 4-50 (USAF, 2002)

PM-10 Trucks Driving on Paved Roads								
			$EF = k(sL/2)^{0.65} (W/3)^{1.5}$			**0.115**	**EF**	
Miles/round trip	10							
Trucks/hour	6		where k= particle size multiplier for PM_{10} (0.016) where sL = silt loading (g/m^2), W = mean vehicle weight (tons) Assumes average vehicle weight of 22.5 tons EF = emission factor for normal conditions on low traffic roads					
Hours of activity	8							
Days	4							
VMT	1920							
EF (lbs/mile)	0.115							
TOTAL (lbs)	221.66							
Total (tons)	**0.11**							

Emission factor formula from AP-42 Chapter 13.2.1 Paved Roads (August 2003)

PM-10 Trucks Driving on Unpaved Roads								
Miles/round trip	0.5		$EF = k(s/12)^a(S/30)^d$			2.054		
Trucks/hour	6		$(M/0.5)^c$			1.585		
Hours of activity	8					**1.296**	**EF**	
Days	4		where s = silt (%), M = moisture (%), S = mean vehicle speed (mph) k = particle size multiplier (1.8 for PM_{10}) EF = emission factor for PM10 on unpaved roads (uncontrolled) Sandy loam and loamy sand are typically 10-20 percent silt, an average of 15 percent was used. 5 percent surface moisture was assumed for unpaved roads. Mean vehicle speed assumed is 25 mph					
VMT	96							
EF (lbs/mile)	1.296							
TOTAL (lbs)	124.41							
Total (tons)	**0.06**							

Emission factor formula from AP-42 Chapter 13.2.2 Unpaved Roads (October 2001)

Asphalt								
	East Gate							
		36,048	cu feet					
		1,335	cu yds					
		2,670	tons					

Hot mix asphalt plant (off site)								
		CO	**VOC**	**NO_x**	**SO_x**	**PM_{10}**		
Emission factors		0.4	0.0082	0.025	0.0046	0.027	lbs/ton HMA	
Tons of HMA		2,670						
Emissions		1,068	22	67	12	72	lbs	
Emissions		**0.53**	**0.01**	**0.03**	**0.01**	**0.04**	**tons**	

HMA = hot mix asphalt
Emission factors are for batch mix plants using a natural gas fired dryer, hot screens, and mixer
Emission factors are from AP-42 Vol I Chapter 11.1 Hot Mix Asphalt Plants, April 2004.
PM_{10} emission factor from Table 11.1-1, using fabric filter control
CO, SO_2, and No_x emission factors from Table 11.1-5
VOC emission factor from Table 11.1-6
About 85 percent of HMA plants in use are batch mix plants, and 70 to 90 percent use natural gas.

Hazardous Air Pollutants from Batch Mix Asphalt Plant

Total HAPs		0.0077	emission factor					
		0.17	lbs					
		0.00	**tons**					

Total HAPs calculated from emission factors in Table 11.1-9 of AP-42 Vol I, Chapter 11.1

Summary East Gate	**Amounts in tons**							
	CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**		
Grading (fugitive dust)					0.37			
Trucks - paved roads					0.11			
Trucks - unpaved roads					0.06			
Construction Equipment	1.04	0.24	3.42	0.56	0.23	0.07		
Worker Vehicles	0.39	0.02	0.03	0.00	0.000			
Asphalt plant (off site)	0.53	0.01	0.03	0.01	0.04	0.00		
Total Construction	**1.96**	**0.27**	**3.48**	**0.57**	**0.81**	**0.07**		
Tons Per Year	**1.96**	**0.27**	**3.48**	**0.57**	**0.81**	**0.07**		
Pounds	3930	549	6952	1134	1617	143		
Pounds / day avg	**21**	**3**	**38**	**6**	**9**	**1**		
Tons/day avg	**0.01**	**0.00**	**0.02**	**0.00**	**0.00**	**0.00**		

West Gate Upgrades (2006-7)

Construct vehicle inspection facilities, security features at gate
Widen and rebuild stewart Ave and additional bridge over East Fork Sand Creek
Estimated 18 months to construct (370 work days)
Includes grading, construction of three buildings, and paving access road and turnaround areas
Includes excavation and improvements at gate, and storm water drainage

Grading

PM_{10} emissions (fugitive dust) from grading

$PM = \frac{1.0*s^{1.5}}{M^{1.4}}$		6.103	lb/hr PM	960	hours			
		4.58	lbs/hr PM_{10}	4394.5	lbs PM_{10}			
				2.20	**tons PM_{10}**			
where s = silt (%), M = moisture (%)								
PM_{10} = PM * 0.75								

Sandy loam and loamy sand are typically 10-20 percent silt, an average of 15 percent was used.
5 percent soil moisture was assumed.
Sources: AP-42 Vol I, Chapter 13.2.3 Heavy Construction Operations, January 1995
AP-42 Vol I, Chapter 11.9 Western Surface Coal Mining, October 1998

Area to be graded	21.72	acres						

Construction Equipment Operation

Grading and Excavating

Equipment	**Days**	**Hours/day**	**Pieces**	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Scraper	90	8	3	*593.28*	*62.29*	*1690.85*	*266.98*	*74.16*
Emissions (grams)				1281484.8	134555.9	3652231.7	576668.2	160185.6

Emissions (lbs)				2822.65	296.38	8044.56	1270.19	352.83
Bulldozer	120	8	3	*114.06*	*30.02*	*459.67*	*79.76*	*29.16*
Emissions (grams)				328495.1	86446.1	1323860.0	229699.6	83976.2
Emissions (lbs)				723.56	190.41	2915.99	505.95	184.97
Grader	90	8	2	*164.11*	*46.07*	*760.11*	*125.25*	*44.63*
Emissions (grams)				236324.7	66336.8	1094556.7	180353.1	64263.7
Emissions (lbs)				520.54	146.12	2410.92	397.25	141.55
Roller	90	8	2	*101.29*	*26.66*	*408.22*	*76.16*	*25.89*
Emissions (grams)				145861.6	38384.6	587833.3	109670.4	37287.9
Emissions (lbs)				321.28	84.55	1294.79	241.56	82.13
Backhoe/loader	45	8	3	*277.55*	*54.78*	*282.12*	*38.80*	*42.45*
Emissions (grams)				299756.16	59162.40	304686.36	41906.70	45850.86
Emissions (lbs)				660.26	130.31	671.12	92.31	100.99
Total Emissions	lbs			5048.29	847.77	15337.37	2507.26	862.48
	tons			**2.52**	**0.42**	**7.67**	**1.25**	**0.43**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources

Demolition and Removal of Old Pavement

Equipment	Days	Hours/day	Pieces	CO	VOC	NOx	SOx	PM-10
Backhoe/loader	10	8	3	*277.55*	*54.78*	*282.12*	*38.80*	*42.45*
Emissions (grams)				66612.48	13147.20	67708.08	9312.60	10189.08
Emissions (lbs)				146.72	28.96	149.14	20.51	22.44
Dump Truck	10	8	6	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*
Emissions (grams)				235843.2	24763.5	672153.1	104950.2	29480.4
Emissions (lbs)				519.48	54.55	1480.51	231.17	64.93
Total Emissions	lbs			666.20	83.50	1629.65	251.68	87.38
	tons			**0.33**	**0.04**	**0.81**	**0.13**	**0.04**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources
Estimated for an area approximately 60 by 1700 feet. Additional PM-10 would be generated from road demolition and material handling, but emission factors are not available for these operations (USEPA, 1995)

Paving

Equipment	Days	Hours/day	Pieces	CO	VOC	NOx	SOx	PM-10
Paving Equipment	29	8	3	*102.21*	*26.90*	*411.92*	*69.17*	*26.13*
Emissions (grams)				71138.5	18720.7	286693.5	48138.8	18185.8
Emissions (lbs)				156.69	41.23	631.48	106.03	40.06
Asphalt Paver	29	8	3	*154.86*	*23.10*	*226.73*	*39.79*	*24.81*
Emissions (grams)				107785.1	16078.4	157806.9	27690.6	17269.4
Emissions (lbs)				237.41	35.42	347.59	60.99	38.04
Dump Truck	29	8	15	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*
Emissions (grams)				1709863.2	179535.6	4873110.1	760889.1	213732.9
Emissions (lbs)				3766.22	395.45	10733.72	1675.97	470.78

Roller	29	8	3	*101.29*	*26.66*	*408.22*	*76.16*	*25.89*
Emissions (grams)				70499.8	18552.6	284119.4	53007.4	18022.5
Emissions (lbs)				155.29	40.86	625.81	116.76	39.70
Total Emissions	lbs			4315.61	512.97	12338.61	1959.75	588.57
	tons			**2.16**	**0.26**	**6.17**	**0.98**	**0.29**

Trucks for asphalt

Amount of asphalt		26,516	tons
Amount per load		15	tons
Loads		1768	loads
Days		29	days
Truck trips per day		4	(2 hour round trip for each truck)
Trucks		15	

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources
Asphalt paving assumes standard 10 inch thickness for heavy duty road, 2 tons per cubic yard. Assumes 10 mile round trip for dump trucks (15 ton trucks). Assumes 2 hour round trip for loading, transporting and unloading

Bridge Construction

	Days	**Hours/day**	**Pieces**	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Crane	30	6	2	*73.85*	*30.53*	*549.46*	*91.58*	*24.62*
Emissions (grams)				26586.90	10989.25	197806.54	32967.76	8862.30
Emissions (lbs)				58.56	24.21	435.70	72.62	19.52
Pile drivers	30	8	2	*141.05*	*43.40*	*737.80*	*113.93*	*54.25*
Emissions (grams)				67704.00	20832.00	354144.00	54684.00	26040.00
Emissions (lbs)				149.13	45.89	780.05	120.45	57.36
Dump Truck	10	8	4	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*
Emissions (grams)				157228.8	16509.0	448102.1	69966.8	19653.6
Emissions (lbs)				346.32	36.36	987.01	154.11	43.29
Generators	75	8	2	*56.17*	*39.32*	*387.55*	*66.84*	*40.44*
Emissions (grams)				67399.20	47179.44	465054.48	80205.05	48527.42
Emissions (lbs)				148.46	103.92	1024.35	176.66	106.89
Air Compressors	75	8	2	*33.70*	*23.59*	*232.50*	*40.10*	*24.26*
Emissions (grams)				40435.20	28304.64	279002.88	48117.89	29113.34
Emissions (lbs)				89.06	62.35	614.54	105.99	64.13
Concrete Paver	1	8	1	*154.86*	*23.10*	*226.73*	*39.79*	*24.81*
Emissions (grams)				1238.9	184.8	1813.9	318.3	198.5
Emissions (lbs)				2.73	0.41	4.00	0.70	0.44
Concrete Truck	5	8	10	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*
Emissions (grams)				196536.0	20636.3	560127.6	87458.5	24567.0
Emissions (lbs)				432.90	45.45	1233.76	192.64	54.11
Total Emissions	lbs			1227.16	318.58	5079.41	823.17	345.73
	tons			**0.61**	**0.16**	**2.54**	**0.41**	**0.17**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources

Building Construction

	Days	Hours/day	Pieces	CO	VOC	NOx	SOx	PM-10
Crane	40	6	2	*73.85*	*30.53*	*549.46*	*91.58*	*24.62*
Emissions (grams)				35449.20	14652.34	263742.05	43957.01	11816.40
Emissions (lbs)				78.08	32.27	580.93	96.82	26.03
Generators	75	8	2	*56.17*	*39.32*	*387.55*	*66.84*	*40.44*
Emissions (grams)				67399.20	47179.44	465054.48	80205.05	48527.42
Emissions (lbs)				148.46	103.92	1024.35	176.66	106.89
Air Compressors	75	8	2	*33.70*	*23.59*	*232.50*	*40.10*	*24.26*
Emissions (grams)				40435.20	28304.64	279002.88	48117.89	29113.34
Emissions (lbs)				89.06	62.35	614.54	105.99	64.13
Concrete Truck	2	8	10	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*
Emissions (grams)				78614.4	8254.5	224051.0	34983.4	9826.8
Emissions (lbs)				173.16	18.18	493.50	77.06	21.64
Total Emissions	lbs			488.76	216.72	2713.33	456.53	218.69
	tons			**0.24**	**0.11**	**1.36**	**0.23**	**0.11**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources

Concrete trucks for building floors. Assumes 1 foot thick floor. Assumes 9 cubic yard load for each concrete truck, with a 2 hour round trip.

Relocating Utilities

Equipment	Days	Hours/day	Pieces	CO	VOC	NOx	SOx	PM-10
Backhoe/loader	20	8	3	*277.55*	*54.78*	*282.12*	*38.80*	*42.45*
Emissions (grams)				133224.96	26294.40	135416.16	18625.20	20378.16
Emissions (lbs)				293.45	57.92	298.27	41.02	44.89
Bulldozer	20	8	3	*114.06*	*30.02*	*459.67*	*79.76*	*29.16*
Emissions (grams)				54749.2	14407.7	220643.3	38283.3	13996.0
Emissions (lbs)				120.59	31.73	486.00	84.32	30.83
Crane	20	6	1	*73.85*	*30.53*	*549.46*	*91.58*	*24.62*
Emissions (grams)				8862.30	3663.08	65935.51	10989.25	2954.10
Emissions (lbs)				19.52	8.07	145.23	24.21	6.51
Total Emissions	lbs			433.56	97.72	929.50	149.55	82.22
	tons			**0.22**	**0.05**	**0.46**	**0.07**	**0.04**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources

Estimated Emissions from Highway Trucks								
Water truck								
Exhaust emissions				**CO**	**HC**	**NOx**	**SOx**	**PM-10**
Number of trucks	1		EF (g/mi)	18.8	4.7	8.2	0.512	0.124
Distance (miles)	10		lbs/mi	0.04140969	0.01035242	0.018061674	0.0011278	0.0002731
Days	370		Amt (lbs)	153.22	38.30	66.83	4.17	1.011
Total Miles	3,700		**Amt (tons)**	**0.08**	**0.02**	**0.03**	**0.00**	**0.001**
VOC, CO, and Nox emission factors from AP-42 Vol II Appedix H, Table 7.11 A.2, calendar year 2003, model year 1995 SOx and PM10 emission factors from AFIERA Table 4-50 (USAF, 2002) All emission factors for high altitude (greater than 4,000 feet)								
Total Construction Equipment Emissions								
West Gate				**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
			lbs	12332.79	2115.56	38094.71	6152.12	2186.07
			tons	**6.17**	**1.06**	**19.05**	**3.08**	**1.09**
Hazardous Air Pollutants from Construction Equipment								
Total HAPs		631.07	lbs					
		0.32	**tons**					
Total HAPs calculated from emission factors in Table 7.10 USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources								
Worker Vehicle Trips								
Exhaust				**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Number of workers	30		EF (g/mi)	9.387	0.598	0.655	0.072	0.011
Commute (miles)	15		lbs/mi	0.02067621	0.00131718	0.001442731	0.0001586	2.423E-05
Days	370		Amt (lbs)	3442.59	219.31	240.21	26.41	4.034
Total Miles	166,500		**Amt (tons)**	**1.72**	**0.11**	**0.12**	**0.01**	**0.002**
EF = Emission Factor for calendar year 2000 in grams per mile Emission factor from AP-42 Vol II Appendix H Highway Mobile Source Emission Factor Tables Assumes average vehicle model year of 1995 for high altitude light duty gas powered vehicles with 50,000 miles SOx and PM10 emission factors from AFIERA Table 4-50 (USAF, 2002)								
PM-10 Trucks Driving on Paved Roads								
			$EF = k\underline{(sL/2)^{0.65} (W/3)^{1.5}}$			**0.115**	**EF**	
Miles/round trip	10							
Trucks/hour	7.5		where k= particle size multiplier for PM_{10} (0.016) where sL = silt loading (g/m^2), W = mean vehicle weight (tons) Assumes average vehicle weight of 22.5 tons EF = emission factor for normal conditions on low traffic roads					
Hours of activity	8							
Days	45							
VMT	27000							
EF (lbs/mile)	0.115							
TOTAL (lbs)	3117.1							
Total (tons)	**1.56**							
Emission factor formula from AP-42 Chapter 13.2.1 Paved Roads (August 2003)								
PM-10 Trucks Driving on Unpaved Roads								
Miles/round trip	0.5		$EF = \underline{k(s/12)^a(S/30)^d}$			2.054		
Trucks/hour	7.5		$(M/0.5)^c$			1.585		
Hours of activity	8					**1.296**	**EF**	
Days	45		where s = silt (%), M = moisture (%), S = mean vehicle speed (mph) k = particle size multiplier (1.8 for PM_{10}) EF = emission factor for PM10 on unpaved roads (uncontrolled) Sandy loam and loamy sand are typically 10-20 percent silt,					
VMT	1350							
EF (lbs/mile)	1.296							

TOTAL (lbs)	1749.5		an average of 15 percent was used. 5 percent surface moisture was assumed for unpaved roads. Mean vehicle speed assumed is 25 mph
Total (tons)	**0.87**		

Emission factor formula from AP-42 Chapter 13.2.2 Unpaved Roads (October 2001)

Asphalt

	West Gate							
		357,969	cu feet					
		13,258	cu yds					
		26,516	tons					

Hot mix asphalt plant (off site)

		CO	**VOC**	**NO_x**	**SO_x**	**PM_{10}**		
Emission factors		0.4	0.0082	0.025	0.0046	0.027	lbs/ton HMA	
Tons of HMA		26,516						
Emissions		10,606	217	663	122	716	lbs	
Emissions		**5.30**	**0.11**	**0.33**	**0.06**	**0.36**	**tons**	

HMA = hot mix asphalt
Emission factors are for batch mix plants using a natural gas fired dryer, hot screens, and mixer
Emission factors are from AP-42 Vol I Chapter 11.1 Hot Mix Asphalt Plants, April 2004.
PM_{10} emission factor from Table 11.1-1, using fabric filter control
CO, SO_2, and No_x emission factors from Table 11.1-5
VOC emission factor from Table 11.1-6
About 85 percent of HMA plants in use are batch mix plants, and 70 to 90 percent use natural gas.

Hazardous Air Pollutants from Batch Mix Asphalt Plant

Total HAPs		0.0077	emission factor					
		1.67	lbs					
		0.00	**tons**					

Total HAPs calculated from emission factors in Table 11.1-9 of AP-42 Vol I, Chapter 11.1

Summary West Gate		**Amounts in tons**						
	CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**		
Grading (fugitive dust)					2.20			
Trucks - paved roads					1.56			
Trucks - unpaved roads					0.87			
Construction Equipment	6.17	1.06	19.05	3.08	1.09	0.32		
Worker Vehicles	1.72	0.11	0.12	0.01	0.00			
Asphalt plant (off site)	5.30	0.11	0.33	0.06	0.36	0.00		
Total Construction	**13.19**	**1.28**	**19.50**	**3.15**	**6.08**	**0.32**		
Tons Per Year	**6.60**	**0.64**	**9.75**	**1.58**	**3.04**	**0.16**		
Pounds	26382	2552	38998	6300	12167	631		
Pounds / day avg	**48**	**5**	**71**	**11**	**22**	**1**		
Tons/day avg	**0.02**	**0.00**	**0.04**	**0.01**	**0.01**	**0.00**		

Extend Paine Street to Stewart Ave (2006-7)

Extend current Paine Street to Stewart Ave, a distance of 3,400 feet
Estimated 12 months to construct (250 work days)
Includes grading and paving road

Grading									
PM_{10} emissions (fugitive dust) from grading									
PM = $\frac{1.0 * s^{1.5}}{M^{1.4}}$		6.103	lb/hr PM	480	hours				
		4.58	lbs/hr PM_{10}	2197.3	lbs PM_{10}				
				1.10	**tons PM_{10}**				
where s = silt (%), M = moisture (%) PM_{10} = PM * 0.75 Sandy loam and loamy sand are typically 10-20 percent silt, an average of 15 percent was used. 5 percent soil moisture was assumed.									
Sources: AP-42 Vol I, Chapter 13.2.3 Heavy Construction Operations, January 1995 AP-42 Vol I, Chapter 11.9 Western Surface Coal Mining, October 1998									
Area to be graded	7.81	acres							
Construction Equipment Operation									
Grading and Excavating									
Equipment	**Days**	**Hours/day**	**Pieces**	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	
Scraper	60	8	3	*593.28*	*62.29*	*1690.85*	*266.98*	*74.16*	
Emissions (grams)				854323.2	89703.9	2434821.1	384445.4	106790.4	
Emissions (lbs)				1881.77	197.59	5363.04	846.80	235.22	
Bulldozer	60	8	3	*114.06*	*30.02*	*459.67*	*79.76*	*29.16*	
Emissions (grams)				164247.6	43223.0	661930.0	114849.8	41988.1	
Emissions (lbs)				361.78	95.20	1458.00	252.97	92.48	
Grader	60	8	2	*164.11*	*46.07*	*760.11*	*125.25*	*44.63*	
Emissions (grams)				157549.8	44224.5	729704.4	120235.4	42842.5	
Emissions (lbs)				347.03	97.41	1607.28	264.84	94.37	
Roller	60	8	2	*101.29*	*26.66*	*408.22*	*76.16*	*25.89*	
Emissions (grams)				97241.1	25589.8	391888.9	73113.6	24858.6	
Emissions (lbs)				214.19	56.37	863.19	161.04	54.75	
Backhoe/loader	45	8	3	*277.55*	*54.78*	*282.12*	*38.80*	*42.45*	
Emissions (grams)				299756.16	59162.40	304686.36	41906.70	45850.86	
Emissions (lbs)				660.26	130.31	671.12	92.31	100.99	
Total Emissions	lbs			3465.02	576.88	9962.62	1617.95	577.82	
	tons			**1.73**	**0.29**	**4.98**	**0.81**	**0.29**	
Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling Assumes Tier 1 equipment (model years between 1996 and 2000) Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment. EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor. Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources									
Paving									
Equipment	**Days**	**Hours/day**	**Pieces**	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	
Paving Equipment	14	8	3	*102.21*	*26.90*	*411.92*	*69.17*	*26.13*	
Emissions (grams)				34342.7	9037.6	138403.8	23239.4	8779.3	
Emissions (lbs)				75.64	19.91	304.85	51.19	19.34	
Asphalt Paver	14	8	3	*154.86*	*23.10*	*226.73*	*39.79*	*24.81*	
Emissions (grams)				52034.2	7762.0	76182.6	13367.9	8337.0	
Emissions (lbs)				114.61	17.10	167.80	29.44	18.36	
Dump Truck	14	8	15	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*	
Emissions (grams)				825451.2	86672.4	2352535.9	367325.8	103181.4	

Emissions (lbs)				1818.17	190.91	5181.80	809.09	227.27
Roller	14	8	3	*101.29*	*26.66*	*408.22*	*76.16*	*25.89*
Emissions (grams)				34034.4	8956.4	137161.1	25589.8	8700.5
Emissions (lbs)				74.97	19.73	302.12	56.37	19.16
Total Emissions	lbs			2083.40	247.64	5956.57	946.09	284.14
	tons			**1.04**	**0.12**	**2.98**	**0.47**	**0.14**
Trucks for asphalt								
Amount of asphalt		12,588	tons					
Amount per load		15	tons					
Loads		839	loads					
Days		14	days					
Truck trips per day		4	(2 hour round trip for each truck)					
Trucks		15						
Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling Assumes Tier 1 equipment (model years between 1996 and 2000) Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment. EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor. Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources Asphalt paving assumes standard 10 inch thickness for heavy duty road, 2 tons per cubic yard. Assumes 10 mile round trip for dump trucks (15 ton trucks). Assumes 2 hour round trip for loading, transporting and unloading								
Estimated Emissions from Highway Trucks								
Water truck								
Exhaust emissions				**CO**	**HC**	**NOx**	**SOx**	**PM-10**
Number of trucks	1		EF (g/mi)	18.8	4.7	8.2	0.512	0.124
Distance (miles)	5		lbs/mi	0.04140969	0.01035242	0.018061674	0.0011278	0.0002731
Days	250		Amt (lbs)	51.76	12.94	22.58	1.41	0.341
Total Miles	1,250		**Amt (tons)**	**0.03**	**0.01**	**0.01**	**0.00**	**0.000**
VOC, CO, and Nox emission factors from AP-42 Vol II Appedix H, Table 7.11 A.2, calendar year 2003, model year 1995								
SOx and PM10 emission factors from AFIERA Table 4-50 (USAF, 2002)								
All emission factors for high altitude (greater than 4,000 feet)								
Total Construction Equipment Emissions								
Extend Paine St				**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
			lbs	5600.18	837.46	15941.77	2565.45	862.30
			tons	**2.80**	**0.42**	**7.97**	**1.28**	**0.43**
Hazardous Air Pollutants from Construction Equipment								
Total HAPs		249.81	lbs					
		0.12	**tons**					
Total HAPs calculated from emission factors in Table 7.10 USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources								
Worker Vehicle Trips								
Exhaust				**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Number of workers	20		EF (g/mi)	9.387	0.598	0.655	0.072	0.011
Commute (miles)	15		lbs/mi	0.02067621	0.00131718	0.001442731	0.0001586	2.423E-05
Days	250		Amt (lbs)	1550.72	98.79	108.20	11.89	1.817
Total Miles	75,000		**Amt (tons)**	**0.78**	**0.05**	**0.05**	**0.01**	**0.001**

EF = Emission Factor for calendar year 2000 in grams per mile
Emission factor from AP-42 Vol II Appendix H Highway Mobile Source Emission Factor Tables
Assumes average vehicle model year of 1995 for high altitude light duty gas powered vehicles with 50,000 miles
SOx and PM10 emission factors from AFIERA Table 4-50 (USAF, 2002)

PM-10 Trucks Driving on Paved Roads

			$EF = k(sL/2)^{0.65}(W/3)^{1.5}$			**0.115**	**EF**	
Miles/round trip	10							
Trucks/hour	7.5		where k= particle size multiplier for PM_{10} (0.016) where sL = silt loading (g/m^2), W = mean vehicle weight (tons) Assumes average vehicle weight of 22.5 tons EF = emission factor for normal conditions on low traffic roads					
Hours of activity	8							
Days	14							
VMT	8400							
EF (lbs/mile)	0.115							
TOTAL (lbs)	969.75							
Total (tons)	**0.48**							

Emission factor formula from AP-42 Chapter 13.2.1 Paved Roads (August 2003)

PM-10 Trucks Driving on Unpaved Roads

Miles/round trip	0.5		$EF = k(s/12)^a(S/30)^d$			2.054		
Trucks/hour	7.5		$(M/0.5)^c$			1.585		
Hours of activity	8					**1.296**	**EF**	
Days	14		where s = silt (%), M = moisture (%), S = mean vehicle speed (mph) k = particle size multiplier (1.8 for PM_{10}) EF = emission factor for PM10 on unpaved roads (uncontrolled) Sandy loam and loamy sand are typically 10-20 percent silt, an average of 15 percent was used. 5 percent surface moisture was assumed for unpaved roads. Mean vehicle speed assumed is 25 mph					
VMT	420							
EF (lbs/mile)	1.296							
TOTAL (lbs)	544.3							
Total (tons)	**0.27**							

Emission factor formula from AP-42 Chapter 13.2.2 Unpaved Roads (October 2001)

Asphalt

	Extend Paine Street							
		169,932	cu feet					
		6,294	cu yds					
		12,588	tons					

Hot mix asphalt plant (off site)

		CO	**VOC**	**NO_x**	**SO_x**	**PM_{10}**		
Emission factors		0.4	0.0082	0.025	0.0046	0.027	lbs/ton HMA	
Tons of HMA		12,588						
Emissions		5,035	103	315	58	340	lbs	
Emissions		**2.52**	**0.05**	**0.16**	**0.03**	**0.17**	**tons**	

HMA = hot mix asphalt
Emission factors are for batch mix plants using a natural gas fired dryer, hot screens, and mixer
Emission factors are from AP-42 Vol I Chapter 11.1 Hot Mix Asphalt Plants, April 2004.
PM_{10} emission factor from Table 11.1-1, using fabric filter control
CO, SO_2, and No_x emission factors from Table 11.1-5
VOC emission factor from Table 11.1-6
About 85 percent of HMA plants in use are batch mix plants, and 70 to 90 percent use natural gas.

Hazardous Air Pollutants from Batch Mix Asphalt Plant								
Total HAPs		0.0077	emission factor					
		0.79	lbs					
		0.00	**tons**					
Total HAPs calculated from emission factors in Table 11.1-9 of AP-42 Vol I, Chapter 11.1								
Summary Extend Paine St		**Amounts in tons**						
	CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**		
Grading (fugitive dust)					1.10			
Trucks - paved roads					0.48			
Trucks - unpaved roads					0.27			
Construction Equipment	2.80	0.42	7.97	1.28	0.43	0.12		
Worker Vehicles	0.78	0.05	0.05	0.01	0.00			
Asphalt plant (off site)	2.52	0.05	0.16	0.03	0.17	0.00		
Total Construction	**6.09**	**0.52**	**8.18**	**1.32**	**2.46**	**0.12**		
Tons Per Year	**3.05**	**0.26**	**4.09**	**0.66**	**1.23**	**0.06**		
Pounds	12186	1039	16365	2635	4915	250		
Pounds / day avg	**33**	**3**	**45**	**7**	**13**	**1**		
Tons/day avg	**0.02**	**0.00**	**0.02**	**0.00**	**0.01**	**0.00**		
North Gate Upgrades (not programmed yet)								
Construct vehicle inspection facilities, security features at gate, realign access roads Estimated one year to construct (250 work days) Includes grading, construction of one building, and paving access road and turnaround areas Includes realignment of access road from US Highway 24 and Peterson Road								
Grading								
PM_{10} emissions (fugitive dust) from grading								
PM = $\underline{1.0 * s^{1.5}}$		6.103	lb/hr PM	480	hours			
$M^{1.4}$		4.58	lbs/hr PM_{10}	2197.3	lbs PM_{10}			
				1.10	**tons PM_{10}**			
where s = silt (%), M = moisture (%)								
PM_{10} = PM * 0.75								
Sandy loam and loamy sand are typically 10-20 percent silt, an average of 15 percent was used. 5 percent soil moisture was assumed. Sources: AP-42 Vol I, Chapter 13.2.3 Heavy Construction Operations, January 1995 AP-42 Vol I, Chapter 11.9 Western Surface Coal Mining, October 1998								
Area to be graded	9.68	acres						
Includes a potential realignment of North Gate entrance roads from US highway 24 and Peterson Road								
Construction Equipment Operation								
Grading and Excavating								
Equipment	**Days**	**Hours/day**	**Pieces**	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Scraper	60	8	2	*593.28*	*62.29*	*1690.85*	*266.98*	*74.16*
Emissions (grams)				569548.8	59802.6	1623214.1	256297.0	71193.6
Emissions (lbs)				1254.51	131.72	3575.36	564.53	156.81
Bulldozer	60	8	2	*114.06*	*30.02*	*459.67*	*79.76*	*29.16*
Emissions (grams)				109498.4	28815.4	441286.7	76566.5	27992.1
Emissions (lbs)				241.19	63.47	972.00	168.65	61.66
Grader	60	8	1	*164.11*	*46.07*	*760.11*	*125.25*	*44.63*
Emissions (grams)				78774.9	22112.3	364852.2	60117.7	21421.2
Emissions (lbs)				173.51	48.71	803.64	132.42	47.18

Roller	60	8	2	*101.29*	*26.66*	*408.22*	*76.16*	*25.89*
Emissions (grams)				97241.1	25589.8	391888.9	73113.6	24858.6
Emissions (lbs)				214.19	56.37	863.19	161.04	54.75
Backhoe/loader	30	8	3	*277.55*	*54.78*	*282.12*	*38.80*	*42.45*
Emissions (grams)				199837.44	39441.60	203124.24	27937.80	30567.24
Emissions (lbs)				440.17	86.88	447.41	61.54	67.33
Total Emissions	lbs			2323.57	387.14	6661.60	1088.18	387.74
	tons			**1.16**	**0.19**	**3.33**	**0.54**	**0.19**

Includes a potential realignment of North Gate entrance roads from US highway 24 and Peterson Road
Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources

Paving

Equipment	Days	Hours/day	Pieces	CO	VOC	NOx	SOx	PM-10
Paving Equipment	7	8	4	*102.21*	*26.90*	*411.92*	*69.17*	*26.13*
Emissions (grams)				22895.2	6025.0	92269.2	15493.0	5852.9
Emissions (lbs)				50.43	13.27	203.24	34.13	12.89
Asphalt Paver	7	8	4	*154.86*	*23.10*	*226.73*	*39.79*	*24.81*
Emissions (grams)				34689.4	5174.7	50788.4	8911.9	5558.0
Emissions (lbs)				76.41	11.40	111.87	19.63	12.24
Dump Truck	7	8	15	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*
Emissions (grams)				412725.6	43336.2	1176268.0	183662.9	51590.7
Emissions (lbs)				909.09	95.45	2590.90	404.54	113.64
Roller	7	8	4	*101.29*	*26.66*	*408.22*	*76.16*	*25.89*
Emissions (grams)				22689.6	5970.9	91440.7	17059.8	5800.3
Emissions (lbs)				49.98	13.15	201.41	37.58	12.78
Total Emissions	lbs			1085.90	133.27	3107.41	495.88	151.55
	tons			**0.54**	**0.07**	**1.55**	**0.25**	**0.08**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources
Asphalt paving assumes standard 10 inch thickness for heavy duty road, 2 tons per cubic yard. Assumes 10 mile round trip for dump trucks (15 ton trucks). Assumes 2 hour round trip for loading, transporting and unloading

Trucks for asphalt

Amount of asphalt		6,479	tons					
Amount per load		15	tons					
Loads		432	loads					
Days		7	days					
Truck trips per day		4	(2 hour round trip for each truck)					
Trucks		15						

Building Construction

	Days	Hours/day	Pieces	CO	VOC	NOx	SOx	PM-10
Crane	30	6	2	*73.85*	*30.53*	*549.46*	*91.58*	*24.62*
Emissions (grams)				26586.90	10989.25	197806.54	32967.76	8862.30

Emissions (lbs)				58.56	24.21	435.70	72.62	19.52
Generators	50	8	2	*56.17*	*39.32*	*387.55*	*66.84*	*40.44*
Emissions (grams)				44932.80	31452.96	310036.32	53470.03	32351.62
Emissions (lbs)				98.97	69.28	682.90	117.78	71.26
Air Compressors	50	8	2	*33.70*	*23.59*	*232.50*	*40.10*	*24.26*
Emissions (grams)				26956.80	18869.76	186001.92	32078.59	19408.90
Emissions (lbs)				59.38	41.56	409.70	70.66	42.75
Concrete Truck	1	8	10	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*
Emissions (grams)				39307.2	4127.3	112025.5	17491.7	4913.4
Emissions (lbs)				86.58	9.09	246.75	38.53	10.82
Total Emissions	lbs			303.49	144.14	1775.04	299.58	144.35
	tons			**0.15**	**0.07**	**0.89**	**0.15**	**0.07**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources
Concrete trucks for building floors. Assumes 1 foot thick floor. Assumes 9 cubic yard load for each concrete truck, with a 2 hour round trip.

Estimated Emissions from Highway Trucks

Water truck								
Exhaust emissions				**CO**	**HC**	**NOx**	**SOx**	**PM-10**
Number of trucks	1		EF (g/mi)	18.8	4.7	8.2	0.512	0.124
Distance (miles)	5		lbs/mi	0.0414096 9	0.0103524 2	0.018061674	0.0011278	0.0002731
Days	250		Amt (lbs)	51.76	12.94	22.58	1.41	0.341
Total Miles	1,250		**Amt (tons)**	**0.03**	**0.01**	**0.01**	**0.00**	**0.000**

VOC, CO, and Nox emission factors from AP-42 Vol II Appedix H, Table 7.11 A.2, calendar year 2003, model year 1995
SOx and PM10 emission factors from AFIERA Table 4-50 (USAF, 2002)
All emission factors for high altitude (greater than 4,000 feet)

Total Construction Equipment Emissions

North Gate				**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
			lbs	3764.72	677.49	11566.64	1885.04	683.98
			tons	**1.88**	**0.34**	**5.78**	**0.94**	**0.34**

Hazardous Air Pollutants from Construction Equipment

Total HAPs		202.10	lbs					
		0.10	**tons**					

Total HAPs calculated from emission factors in Table 7.10 USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources

Worker Vehicle Trips

Exhaust				**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Number of workers	20		EF (g/mi)	9.387	0.598	0.655	0.072	0.011
Commute (miles)	15		lbs/mi	0.0206762 1	0.0013171 8	0.001442731	0.0001586	2.423E-05
Days	250		Amt (lbs)	1550.72	98.79	108.20	11.89	1.817
Total Miles	75,000		**Amt (tons)**	**0.78**	**0.05**	**0.05**	**0.01**	**0.001**

EF = Emission Factor for calendar year 2000 in grams per mile
Emission factor from AP-42 Vol II Appendix H Highway Mobile Source Emission Factor Tables
Assumes average vehicle model year of 1995 for high altitude light duty gas powered vehicles with 50,000 miles
SOx and PM10 emission factors from AFIERA Table 4-50 (USAF, 2002)

PM-10 Trucks Driving on Paved Roads

			$EF = k\underline{(sL/2)^{0.65}(W/3)^{1.5}}$			**0.115**	**EF**	
Miles/round trip	10							
Trucks/hour	7.5		where k= particle size multiplier for PM_{10} (0.016)					
Hours of activity	8		where sL = silt loading (g/m^2), W = mean vehicle weight (tons)					
Days	7		Assumes average vehicle weight of 22.5 tons					
VMT	4200		EF = emission factor for normal conditions on low traffic roads					
EF (lbs/mile)	0.115							
TOTAL (lbs)	484.88							
Total (tons)	**0.24**							

Emission factor formula from AP-42 Chapter 13.2.1 Paved Roads (August 2003)

PM-10 Trucks Driving on Unpaved Roads

Miles/round trip	0.5		$EF = \underline{k(s/12)^a(S/30)^d}$			2.054		
Trucks/hour	7.5		$(M/0.5)^c$			1.585		
Hours of activity	8					**1.296**	**EF**	
Days	7							
VMT	210		where s = silt (%), M = moisture (%), S = mean vehicle speed (mph)					
EF (lbs/mile)	1.296		k = particle size multiplier (1.8 for PM_{10})					
TOTAL (lbs)	272.15		EF = emission factor for PM10 on unpaved roads (uncontrolled)					
Total (tons)	**0.14**		Sandy loam and loamy sand are typically 10-20 percent silt, an average of 15 percent was used.					

5 percent surface moisture was assumed for unpaved roads.
Mean vehicle speed assumed is 25 mph

Emission factor formula from AP-42 Chapter 13.2.2 Unpaved Roads (October 2001)

Asphalt

	Realign North Gate							
		87,465	cu feet					
		3,239	cu yds					
		6,479	tons					

Hot mix asphalt plant (off site)

		CO	VOC	NO_x	SO_x	PM_{10}		
Emission factors		0.4	0.0082	0.025	0.0046	0.027	lbs/ton HMA	
Tons of HMA		6,479						
Emissions		2,592	53	162	30	175	lbs	
Emissions		**1.30**	**0.03**	**0.08**	**0.01**	**0.09**	**tons**	

HMA = hot mix asphalt
Emission factors are for batch mix plants using a natural gas fired dryer, hot screens, and mixer
Emission factors are from AP-42 Vol I Chapter 11.1 Hot Mix Asphalt Plants, April 2004.
PM_{10} emission factor from Table 11.1-1, using fabric filter control
CO, SO_2, and No_x emission factors from Table 11.1-5
VOC emission factor from Table 11.1-6
About 85 percent of HMA plants in use are batch mix plants, and 70 to 90 percent use natural gas.

Hazardous Air Pollutants from Batch Mix Asphalt Plant

Total HAPs		0.0077	emission factor					
		0.41	lbs					
		0.00	**tons**					

Total HAPs calculated from emission factors in Table 11.1-9 of AP-42 Vol I, Chapter 11.1

Summary North Gate		**Amounts in tons**						
	CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**		
Grading (fugitive dust)					1.10			
Trucks - paved roads					0.24			
Trucks - unpaved roads					0.14			
Construction Equipment	1.88	0.34	5.78	0.94	0.34	0.10		
Worker Vehicles	0.78	0.05	0.05	0.01	0.00			
Asphalt plant (off site)	1.30	0.03	0.08	0.01	0.09	0.00		
Total Construction	**3.95**	**0.41**	**5.92**	**0.96**	**1.91**	**0.10**		
Tons Per Year	**1.98**	**0.21**	**2.96**	**0.48**	**0.95**	**0.05**		
Pounds	7907	829	11837	1927	3815	202		
Pounds / day avg	**22**	**2**	**32**	**5**	**10**	**1**		
Tons/day avg	**0.01**	**0.00**	**0.02**	**0.00**	**0.01**	**0.00**		

Northeast Gate Upgrades (not programmed yet)

Construct vehicle inspection facilities, security features at gate, access road
Estimated nine months to construct (190 work days)
Includes grading, construction of one building, and paving access road and turnaround areas

Grading

PM_{10} emissions (fugitive dust) from grading

PM = $\underline{1.0*s^{1.5}}$		6.103	lb/hr PM	320	hours			
$M^{1.4}$		4.58	lbs/hr PM_{10}	1464.8	lbs PM_{10}			
				0.73	**tons PM_{10}**			

where s = silt (%), M = moisture (%)
PM_{10} = PM * 0.75
Sandy loam and loamy sand are typically 10-20 percent silt, an average of 15 percent was used.
5 percent soil moisture was assumed.
Sources: AP-42 Vol I, Chapter 13.2.3 Heavy Construction Operations, January 1995
AP-42 Vol I, Chapter 11.9 Western Surface Coal Mining, October 1998

Area to be graded	3.06	acres						

Construction Equipment Operation

Grading and Excavating

Equipment	**Days**	**Hours/day**	**Pieces**	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Scraper	40	8	2	*593.28*	*62.29*	*1690.85*	*266.98*	*74.16*
Emissions (grams)				379699.2	39868.4	1082142.7	170864.6	47462.4
Emissions (lbs)				836.34	87.82	2383.57	376.35	104.54
Bulldozer	40	8	2	*114.06*	*30.02*	*459.67*	*79.76*	*29.16*
Emissions (grams)				72998.9	19210.2	294191.1	51044.4	18661.4
Emissions (lbs)				160.79	42.31	648.00	112.43	41.10
Grader	40	8	1	*164.11*	*46.07*	*760.11*	*125.25*	*44.63*
Emissions (grams)				52516.6	14741.5	243234.8	40078.5	14280.8
Emissions (lbs)				115.68	32.47	535.76	88.28	31.46

Roller	40	8	2	*101.29*	*26.66*	*408.22*	*76.16*	*25.89*
Emissions (grams)				64827.4	17059.8	261259.3	48742.4	16572.4
Emissions (lbs)				142.79	37.58	575.46	107.36	36.50
Backhoe/loader	20	8	3	*277.55*	*54.78*	*282.12*	*38.80*	*42.45*
Emissions (grams)				133224.96	26294.40	135416.16	18625.20	20378.16
Emissions (lbs)				293.45	57.92	298.27	41.02	44.89
Total Emissions	lbs			1549.05	258.09	4441.07	725.45	258.49
	tons			**0.77**	**0.13**	**2.22**	**0.36**	**0.13**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources

Paving

Equipment	Days	Hours/day	Pieces	CO	VOC	NOx	SOx	PM-10
Paving Equipment	5	8	4	*102.21*	*26.90*	*411.92*	*69.17*	*26.13*
Emissions (grams)				16353.7	4303.6	65906.6	11066.4	4180.6
Emissions (lbs)				36.02	9.48	145.17	24.38	9.21
Asphalt Paver	5	8	4	*154.86*	*23.10*	*226.73*	*39.79*	*24.81*
Emissions (grams)				24778.2	3696.2	36277.4	6365.7	3970.0
Emissions (lbs)				54.58	8.14	79.91	14.02	8.74
Dump Truck	5	8	13	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*
Emissions (grams)				255496.8	26827.2	728165.9	113696.1	31937.1
Emissions (lbs)				562.77	59.09	1603.89	250.43	70.35
Roller	5	8	4	*101.29*	*26.66*	*408.22*	*76.16*	*25.89*
Emissions (grams)				16206.8	4265.0	65314.8	12185.6	4143.1
Emissions (lbs)				35.70	9.39	143.87	26.84	9.13
Total Emissions	lbs			689.06	86.11	1972.83	315.67	97.42
	tons			**0.34**	**0.04**	**0.99**	**0.16**	**0.05**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources
Asphalt paving assumes standard 10 inch thickness for heavy duty road, 2 tons per cubic yard. Assumes 10 mile round trip for dump trucks (15 ton trucks). Assumes 2 hour round trip for loading, transporting and unloading

Trucks for asphalt

Amount of asphalt		3,940	tons
Amount per load		15	tons
Loads		263	loads
Days		5	days
Truck trips per day		4	(2 hour round trip for each truck)
Trucks		13	

Building Construction

	Days	Hours/day	Pieces	CO	VOC	NOx	SOx	PM-10
Crane	30	6	2	*73.85*	*30.53*	*549.46*	*91.58*	*24.62*
Emissions (grams)				26586.90	10989.25	197806.54	32967.76	8862.30

Emissions (lbs)				58.56	24.21	435.70	72.62	19.52
Generators	50	8	2	*56.17*	*39.32*	*387.55*	*66.84*	*40.44*
Emissions (grams)				44932.80	31452.96	310036.32	53470.03	32351.62
Emissions (lbs)				98.97	69.28	682.90	117.78	71.26
Air Compressors	50	8	2	*33.70*	*23.59*	*232.50*	*40.10*	*24.26*
Emissions (grams)				26956.80	18869.76	186001.92	32078.59	19408.90
Emissions (lbs)				59.38	41.56	409.70	70.66	42.75
Concrete Truck	1	8	10	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*
Emissions (grams)				39307.2	4127.3	112025.5	17491.7	4913.4
Emissions (lbs)				86.58	9.09	246.75	38.53	10.82
Total Emissions	lbs			303.49	144.14	1775.04	299.58	144.35
	tons			**0.15**	**0.07**	**0.89**	**0.15**	**0.07**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources
Concrete trucks for building floors. Assumes 1 foot thick floor. Assumes 9 cubic yard load for each concrete truck, with a 2 hour round trip.

Estimated Emissions from Highway Trucks

Water truck								
Exhaust emissions				**CO**	**HC**	**NOx**	**SOx**	**PM-10**
Number of trucks	1		EF (g/mi)	18.8	4.7	8.2	0.512	0.124
Distance (miles)	5		lbs/mi	0.04140969	0.01035242	0.018061674	0.0011278	0.0002731
Days	190		Amt (lbs)	39.34	9.83	17.16	1.07	0.259
Total Miles	950		**Amt (tons)**	**0.02**	**0.00**	**0.01**	**0.00**	**0.000**

VOC, CO, and Nox emission factors from AP-42 Vol II Appedix H, Table 7.11 A.2, calendar year 2003, model year 1995
SOx and PM10 emission factors from AFIERA Table 4-50 (USAF, 2002)
All emission factors for high altitude (greater than 4,000 feet)

Total Construction Equipment Emissions

				CO	**VOC**	**NOx**	**SOx**	**PM-10**
Northeast Gate			lbs	2580.94	498.17	8206.10	1341.77	500.53
			tons	**1.29**	**0.25**	**4.10**	**0.67**	**0.25**

Hazardous Air Pollutants from Construction Equipment

Total HAPs		148.61	lbs					
		0.07	**tons**					

Total HAPs calculated from emission factors in Table 7.10 USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources

Exhaust				**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Number of workers	20		EF (g/mi)	9.387	0.598	0.655	0.072	0.011
Commute (miles)	15		lbs/mi	0.02067621	0.00131718	0.001442731	0.0001586	2.423E-05
Days	190		Amt (lbs)	1178.54	75.08	82.24	9.04	1.381
Total Miles	57,000		**Amt (tons)**	**0.59**	**0.04**	**0.04**	**0.00**	**0.001**

EF = Emission Factor for calendar year 2000 in grams per mile
Emission factor from AP-42 Vol II Appendix H Highway Mobile Source Emission Factor Tables
Assumes average vehicle model year of 1995 for high altitude light duty gas powered vehicles with 50,000 miles
SOx and PM10 emission factors from AFIERA Table 4-50 (USAF, 2002)

PM-10 Trucks Driving on Paved Roads								
			$EF = k(sL/2)^{0.65}(W/3)^{1.5}$			**0.115**	**EF**	
Miles/round trip	10							
Trucks/hour	7		where k= particle size multiplier for PM_{10} (0.016) where sL = silt loading (g/m^2), W = mean vehicle weight (tons) Assumes average vehicle weight of 22.5 tons EF = emission factor for normal conditions on low traffic roads					
Hours of activity	8							
Days	5							
VMT	2800							
EF (lbs/mile)	0.115							
TOTAL (lbs)	323.25							
Total (tons)	**0.16**							
Emission factor formula from AP-42 Chapter 13.2.1 Paved Roads (August 2003)								

PM-10 Trucks Driving on Unpaved Roads								
Miles/round trip	0.5		$EF = k(s/12)^a(S/30)^d$			2.054		
Trucks/hour	7		$(M/0.5)^c$			1.585		
Hours of activity	8					**1.296**	**EF**	
Days	5		where s = silt (%), M = moisture (%), S = mean vehicle speed (mph) k = particle size multiplier (1.8 for PM_{10}) EF = emission factor for PM10 on unpaved roads (uncontrolled) Sandy loam and loamy sand are typically 10-20 percent silt, an average of 15 percent was used. 5 percent surface moisture was assumed for unpaved roads. Mean vehicle speed assumed is 25 mph					
VMT	140							
EF (lbs/mile)	1.296							
TOTAL (lbs)	181.43							
Total (tons)	**0.09**							
Emission factor formula from AP-42 Chapter 13.2.2 Unpaved Roads (October 2001)								

Asphalt								
	Construct Northeast Gate							
		53,187	cu feet					
		1,970	cu yds					
		3,940	tons					

Hot mix asphalt plant (off site)								
		CO	**VOC**	**NO_x**	**SO_x**	**PM_{10}**		
Emission factors		0.4	0.0082	0.025	0.0046	0.027	lbs/ton HMA	
Tons of HMA		3,940						
Emissions		1,576	32	98	18	106	lbs	
Emissions		**0.79**	**0.02**	**0.05**	**0.01**	**0.05**	**tons**	

HMA = hot mix asphalt
Emission factors are for batch mix plants using a natural gas fired dryer, hot screens, and mixer
Emission factors are from AP-42 Vol I Chapter 11.1 Hot Mix Asphalt Plants, April 2004.
PM_{10} emission factor from Table 11.1-1, using fabric filter control
CO, SO_2, and No_x emission factors from Table 11.1-5
VOC emission factor from Table 11.1-6
About 85 percent of HMA plants in use are batch mix plants, and 70 to 90 percent use natural gas.

Hazardous Air Pollutants from Batch Mix Asphalt Plant								
Total HAPs		0.0077	emission factor					
		0.25	lbs					
		0.00	**tons**					
Total HAPs calculated from emission factors in Table 11.1-9 of AP-42 Vol I, Chapter 11.1								

Summary Northeast Gate	Amounts in tons							
	CO	VOC	NOx	SOx	PM-10	HAPs		
Grading (fugitive dust)					0.73			
Trucks - paved roads					0.16			
Trucks - unpaved roads					0.09			
Construction Equipment	1.29	0.25	4.10	0.67	0.25	0.07		
Worker Vehicles	0.59	0.04	0.04	0.00	0.00			
Asphalt plant (off site)	0.79	0.02	0.05	0.01	0.05	0.00		
Total Construction	**2.67**	**0.30**	**4.19**	**0.68**	**1.29**	**0.07**		
Tons Per Year	**2.67**	**0.30**	**4.19**	**0.68**	**1.29**	**0.07**		
Pounds	5335	606	8387	1369	2578	149		
Pounds / day avg	**20**	**2**	**31**	**5**	**9**	**1**		
Tons/day avg	**0.01**	**0.00**	**0.02**	**0.00**	**0.00**	**0.00**		

Widen Stewart Ave (Not yet programmed)

Widen Stewart Ave, a distance of 6,000 feet
Estimated 18 months to construct (370 work days)
Includes grading and paving road

Grading

PM_{10} emissions (fugitive dust) from grading

PM = $\frac{1.0*s^{1.5}}{M^{1.4}}$		6.103	lb/hr PM	960	hours			
		4.58	lbs/hr PM_{10}	4394.5	lbs PM_{10}			
				2.20	**tons PM_{10}**			

where s = silt (%), M = moisture (%)
PM_{10} = PM * 0.75
Sandy loam and loamy sand are typically 10-20 percent silt, an average of 15 percent was used.
5 percent soil moisture was assumed.
Sources: AP-42 Vol I, Chapter 13.2.3 Heavy Construction Operations, January 1995
AP-42 Vol I, Chapter 11.9 Western Surface Coal Mining, October 1998

Area to be graded	4.10	acres						

Construction Equipment Operation

Grading and Excavating

Equipment	Days	Hours/day	Pieces	CO	VOC	NOx	SOx	PM-10
Scraper	120	8	3	*593.28*	*62.29*	*1690.85*	*266.98*	*74.16*
Emissions (grams)				1708646.4	179407.9	4869642.2	768890.9	213580.8
Emissions (lbs)				3763.54	395.17	10726.08	1693.59	470.44
Bulldozer	120	8	3	*114.06*	*30.02*	*459.67*	*79.76*	*29.16*
Emissions (grams)				328495.1	86446.1	1323860.0	229699.6	83976.2
Emissions (lbs)				723.56	190.41	2915.99	505.95	184.97
Grader	120	8	2	*164.11*	*46.07*	*760.11*	*125.25*	*44.63*
Emissions (grams)				315099.6	88449.0	1459408.9	240470.8	85685.0
Emissions (lbs)				694.05	194.82	3214.56	529.67	188.73
Roller	120	8	2	*101.29*	*26.66*	*408.22*	*76.16*	*25.89*
Emissions (grams)				194482.2	51179.5	783777.8	146227.2	49717.2
Emissions (lbs)				428.37	112.73	1726.38	322.09	109.51
Backhoe/loader	90	8	3	*277.55*	*54.78*	*282.12*	*38.80*	*42.45*
Emissions (grams)				599512.32	118324.80	609372.72	83813.40	91701.72
Emissions (lbs)				1320.51	260.63	1342.23	184.61	201.99

Total Emissions	lbs			6930.03	1153.76	19925.25	3235.91	1155.64
	tons			**3.47**	**0.58**	**9.96**	**1.62**	**0.58**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources

Paving

Equipment	**Days**	**Hours/day**	**Pieces**	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Paving Equipment	12	8	4	*102.21*	*26.90*	*411.92*	*69.17*	*26.13*
Emissions (grams)				39248.8	10328.6	158175.7	26559.4	10033.5
Emissions (lbs)				86.45	22.75	348.40	58.50	22.10
Asphalt Paver	12	8	4	*154.86*	*23.10*	*226.73*	*39.79*	*24.81*
Emissions (grams)				59467.6	8870.9	87065.9	15277.6	9528.0
Emissions (lbs)				130.99	19.54	191.78	33.65	20.99
Dump Truck	12	8	15	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*
Emissions (grams)				707529.6	74290.6	2016459.4	314850.7	88441.2
Emissions (lbs)				1558.44	163.64	4441.54	693.50	194.80
Roller	12	8	4	*101.29*	*26.66*	*408.22*	*76.16*	*25.89*
Emissions (grams)				38896.4	10235.9	156755.6	29245.4	9943.4
Emissions (lbs)				85.67	22.55	345.28	64.42	21.90
Total Emissions	lbs			1861.55	228.47	5327.00	850.07	259.79
	tons			**0.93**	**0.11**	**2.66**	**0.43**	**0.13**

Trucks for asphalt

Amount of asphalt		11,014	tons					
Amount per load		15	tons					
Loads		734	loads					
Days		12	days					
Truck trips per day		4	(2 hour round trip for each truck)					
Trucks		15						

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources
Asphalt paving assumes standard 10 inch thickness for heavy duty road, 2 tons per cubic yard. Assumes 10 mile round trip for dump trucks (15 ton trucks). Assumes 2 hour round trip for loading, transporting and unloading

Demolition and Removal of Old Pavement

Equipment	**Days**	**Hours/day**	**Pieces**	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Backhoe/loader	5	8	3	*277.55*	*54.78*	*282.12*	*38.80*	*42.45*
Emissions (grams)				33306.24	6573.60	33854.04	4656.30	5094.54
Emissions (lbs)				73.36	14.48	74.57	10.26	11.22
Dump Truck	5	8	6	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*
Emissions (grams)				117921.6	12381.8	336076.6	52475.1	14740.2
Emissions (lbs)				259.74	27.27	740.26	115.58	32.47
Total Emissions	lbs			333.10	41.75	814.83	125.84	43.69
	tons			**0.17**	**0.02**	**0.41**	**0.06**	**0.02**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources
Estimated for an area approximately 40 by 1600 feet. Additional PM-10 would be generated from road demolition and material handling, but emission factors are not available for these operations (USEPA, 1995)

Estimated Emissions from Highway Trucks

Water truck								
Exhaust emissions				**CO**	**HC**	**NOx**	**SOx**	**PM-10**
Number of trucks	1		EF (g/mi)	18.8	4.7	8.2	0.512	0.124
Distance (miles)	5		lbs/mi	0.04140969	0.01035242	0.018061674	0.0011278	0.0002731
Days	370		Amt (lbs)	76.61	19.15	33.41	2.09	0.505
Total Miles	1,850		**Amt (tons)**	**0.04**	**0.01**	**0.02**	**0.00**	**0.000**

VOC, CO, and Nox emission factors from AP-42 Vol II Appedix H, Table 7.11 A.2, calendar year 2003, model year 1995
SOx and PM10 emission factors from AFIERA Table 4-50 (USAF, 2002)
All emission factors for high altitude (greater than 4,000 feet)

Total Construction Equipment Emissions

Widen Stewart Ave				**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
			lbs	9201.29	1443.14	26100.48	4213.91	1459.63
			tons	**4.60**	**0.72**	**13.05**	**2.11**	**0.73**

Hazardous Air Pollutants from Construction Equipment

Total HAPs		430.49	lbs					
		0.22	**tons**					

Total HAPs calculated from emission factors in Table 7.10 USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources

Worker Vehicle Trips

Exhaust				**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Number of workers	20		EF (g/mi)	9.387	0.598	0.655	0.072	0.011
Commute (miles)	15		lbs/mi	0.02067621	0.00131718	0.001442731	0.0001586	2.423E-05
Days	370		Amt (lbs)	2295.06	146.21	160.14	17.60	2.689
Total Miles	111,000		**Amt (tons)**	**1.15**	**0.07**	**0.08**	**0.01**	**0.001**

EF = Emission Factor for calendar year 2000 in grams per mile
Emission factor from AP-42 Vol II Appendix H Highway Mobile Source Emission Factor Tables
Assumes average vehicle model year of 1995 for high altitude light duty gas powered vehicles with 50,000 miles
SOx and PM10 emission factors from AFIERA Table 4-50 (USAF, 2002)

			$EF = k(sL/2)^{0.65} (W/3)^{1.5}$			**0.115**	**EF**	
Miles/round trip	10							
Trucks/hour	7.5		where k= particle size multiplier for PM_{10} (0.016) where sL = silt loading (g/m^2), W = mean vehicle weight (tons) Assumes average vehicle weight of 22.5 tons EF = emission factor for normal conditions on low traffic roads					
Hours of activity	8							
Days	12							
VMT	7200							
EF (lbs/mile)	0.115							
TOTAL (lbs)	831.22							
Total (tons)	**0.42**							

Emission factor formula from AP-42 Chapter 13.2.1 Paved Roads (August 2003)

PM-10 Trucks Driving on Unpaved Roads								
Miles/round trip	0.5		EF = $\underline{k(s/12)^a(S/30)^d}$			2.054		
Trucks/hour	7.5		$(M/0.5)^c$			1.585		
Hours of activity	8					**1.296**	**EF**	
Days	12							
VMT	360							
EF (lbs/mile)	1.296							
TOTAL (lbs)	466.55							
Total (tons)	**0.23**							

where s = silt (%), M = moisture (%), S = mean vehicle speed (mph)
k = particle size multiplier (1.8 for PM_{10})
EF = emission factor for PM10 on unpaved roads (uncontrolled)
Sandy loam and loamy sand are typically 10-20 percent silt,
an average of 15 percent was used.
5 percent surface moisture was assumed for unpaved roads.
Mean vehicle speed assumed is 25 mph

Emission factor formula from AP-42 Chapter 13.2.2 Unpaved Roads (October 2001)

Asphalt								
	Widen Stewart Ave							
		148,691	cu feet					
		5,507	cu yds					
		11,014	tons					

Hot mix asphalt plant (off site)								
		CO	**VOC**	**NO_x**	**SO_x**	**PM_{10}**		
Emission factors		0.4	0.0082	0.025	0.0046	0.027	lbs/ton HMA	
Tons of HMA		11,014						
Emissions		4,406	90	275	51	297	lbs	
Emissions		**2.20**	**0.05**	**0.14**	**0.03**	**0.15**	**tons**	

HMA = hot mix asphalt
Emission factors are for batch mix plants using a natural gas fired dryer, hot screens, and mixer
Emission factors are from AP-42 Vol I Chapter 11.1 Hot Mix Asphalt Plants, April 2004.
PM_{10} emission factor from Table 11.1-1, using fabric filter control
CO, SO_2, and No_x emission factors from Table 11.1-5
VOC emission factor from Table 11.1-6
About 85 percent of HMA plants in use are batch mix plants, and 70 to 90 percent use natural gas.

Hazardous Air Pollutants from Batch Mix Asphalt Plant								
Total HAPs		0.0077	emission factor					
		0.70	lbs					
		0.00	**tons**					

Total HAPs calculated from emission factors in Table 11.1-9 of AP-42 Vol I, Chapter 11.1

Summary Widen Stewart		**Amounts in tons**						
	CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**		
Grading (fugitive dust)					2.20			
Trucks - paved roads					0.42			
Trucks - unpaved roads					0.23			
Construction Equipment	4.60	0.72	13.05	2.11	0.73	0.22		
Worker Vehicles	1.15	0.07	0.08	0.01	0.00			
Asphalt plant (off site)	2.20	0.05	0.14	0.03	0.15	0.00		
Total Construction	**7.95**	**0.84**	**13.27**	**2.14**	**3.73**	**0.22**		
Tons Per Year	**3.98**	**0.42**	**6.63**	**1.07**	**1.86**	**0.11**		
Pounds	15902	1680	26536	4282	7452	430		
Pounds / day avg	**29**	**3**	**48**	**8**	**14**	**1**		

Tons/day avg	**0.01**	**0.00**	**0.02**	**0.00**	**0.01**	**0.00**		

Realign Stewart Ave and Mitchell St (Not yet programmed)

Realign intersection and widen Stewart, a distance of 2,400 feet
Estimated 18 months to construct (370 work days)
Includes grading and paving roads
Does not include demolition of Temp Living Quarters or construction of new TLQs

Grading

PM_{10} emissions (fugitive dust) from grading

PM = $\underline{1.0 * s^{1.5}}$		6.103	lb/hr PM	960	hours			
$M^{1.4}$		4.58	lbs/hr PM_{10}	4394.5	lbs PM_{10}			
				2.20	**tons PM_{10}**			

where s = silt (%), M = moisture (%)
PM_{10} = PM * 0.75
Sandy loam and loamy sand are typically 10-20 percent silt, an average of 15 percent was used.
5 percent soil moisture was assumed.
Sources: AP-42 Vol I, Chapter 13.2.3 Heavy Construction Operations, January 1995
AP-42 Vol I, Chapter 11.9 Western Surface Coal Mining, October 1998

Area to be graded	6.25	acres						

Construction Equipment Operation

Grading and Excavating

Equipment	**Days**	**Hours/day**	**Pieces**	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Scraper	90	8	3	*593.28*	*62.29*	*1690.85*	*266.98*	*74.16*
Emissions (grams)				1281484.8	134555.9	3652231.7	576668.2	160185.6
Emissions (lbs)				2822.65	296.38	8044.56	1270.19	352.83
Bulldozer	120	8	3	*114.06*	*30.02*	*459.67*	*79.76*	*29.16*
Emissions (grams)				328495.1	86446.1	1323860.0	229699.6	83976.2
Emissions (lbs)				723.56	190.41	2915.99	505.95	184.97
Grader	120	8	2	*164.11*	*46.07*	*760.11*	*125.25*	*44.63*
Emissions (grams)				315099.6	88449.0	1459408.9	240470.8	85685.0
Emissions (lbs)				694.05	194.82	3214.56	529.67	188.73
Roller	90	8	2	*101.29*	*26.66*	*408.22*	*76.16*	*25.89*
Emissions (grams)				145861.6	38384.6	587833.3	109670.4	37287.9
Emissions (lbs)				321.28	84.55	1294.79	241.56	82.13
Backhoe/loader	90	8	3	*277.55*	*54.78*	*282.12*	*38.80*	*42.45*
Emissions (grams)				599512.32	118324.80	609372.72	83813.40	91701.72
Emissions (lbs)				1320.51	260.63	1342.23	184.61	201.99
Total Emissions	lbs			5882.06	1026.79	16812.13	2731.99	1010.65
	tons			**2.94**	**0.51**	**8.41**	**1.37**	**0.51**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources

Paving

Equipment	**Days**	**Hours/day**	**Pieces**	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Paving Equipment	9	8	4	*102.21*	*26.90*	*411.92*	*69.17*	*26.13*
Emissions (grams)				29436.6	7746.5	118631.8	19919.5	7525.2
Emissions (lbs)				64.84	17.06	261.30	43.88	16.58

Asphalt Paver	9	8	4	*154.86*	*23.10*	*226.73*	*39.79*	*24.81*
Emissions (grams)				44600.7	6653.1	65299.4	11458.2	7146.0
Emissions (lbs)				98.24	14.65	143.83	25.24	15.74
Dump Truck	9	8	15	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*
Emissions (grams)				530647.2	55718.0	1512344.5	236138.0	66330.9
Emissions (lbs)				1168.83	122.73	3331.16	520.13	146.10
Roller	9	8	4	*101.29*	*26.66*	*408.22*	*76.16*	*25.89*
Emissions (grams)				29172.3	7676.9	117566.7	21934.1	7457.6
Emissions (lbs)				64.26	16.91	258.96	48.31	16.43
Total Emissions	lbs			1396.16	171.35	3995.25	637.55	194.84
	tons			**0.70**	**0.09**	**2.00**	**0.32**	**0.10**

Trucks for asphalt

Amount of asphalt		8,330	tons					
Amount per load		15	tons					
Loads		555	loads					
Days		9	days					
Truck trips per day		4	(2 hour round trip for each truck)					
Trucks		15						

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources
Asphalt paving assumes standard 10 inch thickness for heavy duty road, 2 tons per cubic yard. Assumes 10 mile round trip for dump trucks (15 ton trucks). Assumes 2 hour round trip for loading, transporting and unloading

Demolition and Removal of Old Pavement

Equipment	**Days**	**Hours/day**	**Pieces**	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Backhoe/loader	15	8	3	*277.55*	*54.78*	*282.12*	*38.80*	*42.45*
Emissions (grams)				99918.72	19720.80	101562.12	13968.90	15283.62
Emissions (lbs)				220.09	43.44	223.71	30.77	33.66
Dump Truck	15	8	6	*491.34*	*51.59*	*1400.32*	*218.65*	*61.42*
Emissions (grams)				353764.8	37145.3	1008229.7	157425.3	44220.6
Emissions (lbs)				779.22	81.82	2220.77	346.75	97.40
Total Emissions	lbs			999.30	125.26	2444.48	377.52	131.07
	tons			**0.50**	**0.06**	**1.22**	**0.19**	**0.07**

Emission factors from USEPA, 2002 Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling
Assumes Tier 1 equipment (model years between 1996 and 2000)
Emission factors (EF) (in italics) are calculated with the following formula: EF in grams/horsepower-hour multiplied by horsepower, multiplied times the typical load factor for each type of equipment.
EFs and horsepower are derived from USEPA, 2002, using the steady state EF multiplied by the transient adjustment factor.
Typical load factor from AFIERA, USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources
Estimated for an area approximately 60 by 1100 feet and 30 by 1470 feet. Additional PM-10 would be generated from road demolition and material handling, but emission factors are not available for these operations (USEPA, 1995)

Estimated Emissions from Highway Trucks

Water truck								
Exhaust emissions				**CO**	**HC**	**NOx**	**SOx**	**PM-10**
Number of trucks	1		EF (g/mi)	18.8	4.7	8.2	0.512	0.124
Distance (miles)	5		lbs/mi	0.0414	0.0104	0.0181	0.0011	0.0003
Days	370		Amt (lbs)	76.61	19.15	33.41	2.09	0.505

Total Miles	1,850		**Amt (tons)**	**0.04**	**0.01**	**0.02**	**0.00**	**0.000**
VOC, CO, and Nox emission factors from AP-42 Vol II Appedix H, Table 7.11 A.2, calendar year 2003, model year 1995 SOx and PM10 emission factors from AFIERA Table 4-50 (USAF, 2002) All emission factors for high altitude (greater than 4,000 feet)								
Total Construction Equipment Emissions				**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Realign Stewart & Mitchell			lbs	8354.13	1342.55	23285.27	3749.15	1337.07
			tons	**4.18**	**0.67**	**11.64**	**1.87**	**0.67**
Hazardous Air Pollutants from Construction Equipment								
Total HAPs		400.48	lbs					
		0.20	**tons**					
Total HAPs calculated from emission factors in Table 7.10 USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources								
Worker Vehicle Trips								
Exhaust				**CO**	**VOC**	**NOx**	**SOx**	**PM-10**
Number of workers	20		EF (g/mi)	9.387	0.598	0.655	0.072	0.011
Commute (miles)	15		lbs/mi	0.0206762 1	0.0013171 8	0.001442731	0.0001586	2.423E-05
Days	370		Amt (lbs)	2295.06	146.21	160.14	17.60	2.689
Total Miles	111,00 0		**Amt (tons)**	**1.15**	**0.07**	**0.08**	**0.01**	**0.001**
EF = Emission Factor for calendar year 2000 in grams per mile Emission factor from AP-42 Vol II Appendix H Highway Mobile Source Emission Factor Tables Assumes average vehicle model year of 1995 for high altitude light duty gas powered vehicles with 50,000 miles SOx and PM10 emission factors from AFIERA Table 4-50 (USAF, 2002)								
PM-10 Trucks Driving on Paved Roads								
			EF = k($\underline{sL/2)^{0.65}\,(W/3)^{1.5}}$			**0.115**	**EF**	
Miles/round trip	10							
Trucks/hour	7.5		where k= particle size multiplier for PM_{10} (0.016) where sL = silt loading (g/m^2), W = mean vehicle weight (tons) Assumes average vehicle weight of 22.5 tons EF = emission factor for normal conditions on low traffic roads					
Hours of activity	8							
Days	9							
VMT	5400							
EF (lbs/mile)	0.115							
TOTAL (lbs)	623.41							
Total (tons)	**0.31**							
Emission factor formula from AP-42 Chapter 13.2.1 Paved Roads (August 2003)								
PM-10 Trucks Driving on Unpaved Roads								
Miles/round trip	0.5		EF = $\underline{k(s/12)^a(S/30)^d}$			2.054		
Trucks/hour	7.5		$(M/0.5)^c$			1.585		
Hours of activity	8					**1.296**	**EF**	
Days	9		where s = silt (%), M = moisture (%), S = mean vehicle speed (mph) k = particle size multiplier (1.8 for PM_{10}) EF = emission factor for PM10 on unpaved roads (uncontrolled) Sandy loam and loamy sand are typically 10-20 percent silt, an average of 15 percent was used. 5 percent surface moisture was assumed for unpaved roads. Mean vehicle speed assumed is 25 mph					
VMT	270							
EF (lbs/mile)	1.296							
TOTAL (lbs)	349.91							
Total (tons)	**0.17**							
Emission factor formula from AP-42 Chapter 13.2.2 Unpaved Roads (October 2001)								

Asphalt								
	Realign Stewart Ave and Mitchell St							
		112,455	cu feet					
		4,165	cu yds					
		8,330	tons					
Hot mix asphalt plant (off site)								
		CO	**VOC**	**NO_x**	**SO_x**	**PM_{10}**		
Emission factors		0.4	0.0082	0.025	0.0046	0.027	lbs/ton HMA	
Tons of HMA		8,330						
Emissions		3,332	68	208	38	225	lbs	
Emissions		**1.67**	**0.03**	**0.10**	**0.02**	**0.11**	**tons**	

HMA = hot mix asphalt
Emission factors are for batch mix plants using a natural gas fired dryer, hot screens, and mixer
Emission factors are from AP-42 Vol I Chapter 11.1 Hot Mix Asphalt Plants, April 2004.
PM_{10} emission factor from Table 11.1-1, using fabric filter control
CO, SO_2, and No_x emission factors from Table 11.1-5
VOC emission factor from Table 11.1-6
About 85 percent of HMA plants in use are batch mix plants, and 70 to 90 percent use natural gas.

Hazardous Air Pollutants from Batch Mix Asphalt Plant								
Total HAPs		0.0077	emission factor					
		0.53	lbs					
		0.00	**tons**					

Total HAPs calculated from emission factors in Table 11.1-9 of AP-42 Vol I, Chapter 11.1

Summary Widen Stewart		**Amounts in tons**						
	CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**		
Grading (fugitive dust)					2.20			
Trucks - paved roads					0.31			
Trucks - unpaved roads					0.17			
Construction Equipment	4.18	0.67	11.64	1.87	0.67	0.20		
Worker Vehicles	1.15	0.07	0.08	0.01	0.00			
Asphalt plant (off site)	1.67	0.03	0.10	0.02	0.11	0.00		
Total Construction	**6.99**	**0.78**	**11.83**	**1.90**	**3.47**	**0.20**		
Tons Per Year	**3.50**	**0.39**	**5.91**	**0.95**	**1.73**	**0.10**		
Pounds	13981	1557	23654	3805	6933	400		
Pounds / day avg	**26**	**3**	**43**	**7**	**13**	**1**		
Tons/day avg	**0.01**	**0.00**	**0.02**	**0.00**	**0.01**	**0.00**		

Sources:

USEPA, 2004 AP-42 Volume I Chapter 11.1 Hot Mix Asphalt Plants
USEPA, 2003b AP-42 Volume I Chapter 13.2.1 Unpaved Roads
USEPA, 2002 Exhaust and Crankcase Emission Factors for Non Road Engine Modeling
USAF, 2002 Air Emissions Inventory Guidance for Mobile Sources
USEPA, 2001a AP-42 Volume I Chapter 13.2.2 Unpaved Roads
USEPA, 2001b AP-42 Volume I Chapter 11.12 Concrete Batching
USEPA, 2000 AP-42 Volume II Appendix H Highway Mobile Source Emission Factor Tables
USEPA, 1998a AP-42 Volume 1 Chapter 11.9 Western Surface Coal Mining
USEPA, 1998b AP-42 Volume 1 Chapter 1.4 Natural Gas Combustion

USEPA, 1995 AP-42 Volume 1 Chapter 13.2.3 Heavy Construction Operations

See Chapter 5 (References) of the EA for complete reference information

Table C-3 Estimated Air Emissions from Operation of the Proposed Facilities						
Summary of emissions in tons per year from operation (stationary sources)						
	CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Furnaces, boilers	0.04	0.00	0.05	0.00	0.00	0.002
Total	**0.04**	**0.00**	**0.05**	**0.00**	**0.00**	**0.002**
Estimated Natural Gas Consumption from Boilers East Gate facilities						
21400	square feet					
7.57	ft^3 natural gas per ft^2 per month					
30	days per month					
5399.93	consumption per day (ft^3)					
5.40	consumption per day (1000 ft^3)					
Consumption of natural gas derived from current basewide usage						
Estimated Emissions East Gate facilities						
CO	**VOC**	**NOx**	**SOx**	**PM10**		
84	5.5	100	0.6	7.6	Emission Factors (lbs/million ft^3)	
0.0840	0.0055	0.1000	0.0006	0.0076	Emission Factors (lbs/ 1,000 ft^3)	
0.4536	0.0297	0.5400	0.0032	0.0410	lbs/day	
81.6470	5.3459	97.1988	0.5832	7.3871	lbs/year	
0.0408	0.0027	0.0486	0.0003	0.0037	tons/year	
Estimated Natural Gas Consumption from Boilers West Gate facilities						
24600	square feet					
7.57	ft^3 natural gas per ft^2 per month					
30	days per month					
6207.40	consumption per day (ft^3)					
6.21	consumption per day (1000 ft^3)					
Consumption of natural gas derived from current basewide usage						
Estimated Emissions West Gate facilities						
CO	**VOC**	**NOx**	**SOx**	**PM10**		
84	5.5	100	0.6	7.6	Emission Factors (lbs/million ft^3)	
0.0840	0.0055	0.1000	0.0006	0.0076	Emission Factors (lbs/ 1,000 ft^3)	
0.5214	0.0341	0.6207	0.0037	0.0472	lbs/day	
93.8559	6.1453	111.7332	0.6704	8.4917	lbs/year	
0.0469	0.0031	0.0559	0.0003	0.0042	tons/year	
Estimated Natural Gas Consumption from Boilers North Gate facilities						
6400	square feet					
7.57	ft^3 natural gas per ft^2 per month					
30	days per month					
1614.93	consumption per day (ft^3)					
1.61	consumption per day (1000 ft^3)					
Consumption of natural gas derived from current basewide usage						
Estimated Emissions North Gate facilities						
CO	**VOC**	**NOx**	**SOx**	**PM10**		
84	5.5	100	0.6	7.6	Emission Factors (lbs/million ft^3)	
0.0840	0.0055	0.1000	0.0006	0.0076	Emission Factors (lbs/ 1,000 ft^3)	

0.1357	0.0089	0.1615	0.0010	0.0123	lbs/day	
24.4178	1.5988	29.0688	0.1744	2.2092	lbs/year	
0.0122	0.0008	0.0145	0.0001	0.0011	tons/year	
Estimated Natural Gas Consumption from Boilers Northeast Gate facilities						
9600	square feet					
7.57	ft^3 natural gas per ft^2 per month					
30	days per month					
2422.40	consumption per day (ft^3)					
2.42	consumption per day (1000 ft^3)					
Consumption of natural gas derived from current basewide usage						
Estimated Emissions Northeast Gate facilities						
CO	**VOC**	**NOx**	**SOx**	**PM10**		
84	5.5	100	0.6	7.6	Emission Factors (lbs/million ft^3)	
0.0840	0.0055	0.1000	0.0006	0.0076	Emission Factors (lbs/ 1,000 ft^3)	
0.2035	0.0133	0.2422	0.0015	0.0184	lbs/day	
36.6267	2.3982	43.6032	0.2616	3.3138	lbs/year	
0.0183	0.0012	0.0218	0.0001	0.0017	tons/year	
Emission factors from AP-42 Table 1.4-1 (CO, Nox) and Table 1.4-2 (VOC, SOx, and PM10) Source: AP-42 Vol I Chapter 1.4 Natural Gas Combustion, July 1998 CO and Nox emission factors for heating units less than 100 Million British thermal units for uncontrolled combustion from Table 1.4-1 VOC, SOx, and PM10 emission factors are for general natural gas combustion (Table 1.4-2) Estimated emissions are calculated on the basis of 180 days (6 months) operation of furnaces/boilers						
Total Operational Emissions, all Gates						
CO	**VOC**	**NOx**	**SOx**	**PM10**		
236.5474	15.4882	281.6040	1.6896	21.4019	lbs/year	
0.12	0.01	0.14	0.00	0.01	tons/year	
Potential to Emit from Boilers all gate facilities						
CO	**VOC**	**NOx**	**SOx**	**PM10**		
473.09	30.98	563.21	3.38	42.80	lbs/year	
0.24	0.02	0.28	0.00	0.02	tons/year	
Potential to emit based on 12 months (8760 hours) per year Calculated with the same emission factors as listed above for estimated emissions						
Estimated Emissions of HAPs from Boilers						
Inorganic HAPs	**Organic HAPs**	**Total**				
0.00606	1.881198	1.887258	Emission Factors (lbs/million ft^3)			
0.00000606	0.001881198	0.00188726	Emission Factors (lbs/ 1,000 ft^3)			
0.00009	0.02943	0.01019	lbs/day			
0.01707	5.29753	3.66878	lbs/year			
0.00001	0.00265	0.00183	tons/year			
Emission factors from AP-42 Table 1.4-3 Source: AP-42 Vol I Chapter 1.4 Natural Gas Combustion, July 1998 Emission factors are for general natural gas combustion (Table 1.4-2) Estimated emissions are calculated on the basis of 180 days (6 months) operation of furnaces/boilers						

Potential to Emit HAPs from Boilers						
Inorganic HAPs	**Organic HAPs**	**Total**				
0.03413	10.59506	7.33757	lbs/year			
0.00002	0.00530	0.00367	tons/year			
Potential to emit based on 12 months (8760 hours) per year Calculated with the same emission factors as listed above for estimated emissions						

Table C-4
Estimated Area Disturbed by Construction of the Transportation and Security Upgrades

Project	Length (ft)	Width (ft)	Area (ft)	Acres
West Gate				
Widen Stewart west of bridge transition to old (pavement)	390	13.5	5,265	0.12
Widen Stewart west of bridge (pavement)	890	27	24,030	0.55
Widen Stewart west of bridge (pavement)	540	32	17,280	0.40
Turnaround west of bridge (pavement)			5,920	0.14
Turnaround west of bridge (disturbed area)			11,000	0.25
Widen Stewart west of bridge (disturbed area)	390	33.5	13,065	0.30
Widen Stewart west of bridge (disturbed area)	935	70	65,450	1.50
Bridge over Sand Creek (pavement)	305	36	10,980	0.25
Stewart - south road east of bridge (pavement)	1760	35	61,600	1.41
Stewart - south road east of bridge 4 lanes (pavement)	345	50	17,250	0.40
Stewart - north road east of bridge (pavement)	2240	35	78,400	1.80
3 Turnarounds east of bridge (pavement)			17,760	0.41
Visitor center parking (pavement)	200	100	20,000	0.46
VIP gate road and parking lot access (pavement)	325	28	9,100	0.21
Vehicle inspection area (pavement and roof area)	690	235	162,150	3.72
Visitor center (roof area)	80	80	6,400	0.15
West Gate guardhouse (roof area)	80	40	3,200	0.07
West Gate roads and facilities (disturbed area)	635	730	231,775	5.32
West Gate roads and facilities (disturbed area)	650	800	520,000	11.94
West Gate roads and facilities (disturbed area)	500	210	105,000	2.41
North Gate				
North Gate vehicle inspection area (roof area)	84	75	6,300	0.14
North Gate vehicle inspection area (pavement)	150	75	11,250	0.26
North Gate vehicle inspection area (access road pavement)	250	15	3,750	0.09
North Gate vehicle inspection area (disturbed area)	250	150	37,500	0.86
Access road (pavement)	30	3000	90,000	2.07
Access road (disturbed area)	120	3200	384,000	8.82
Extend Paine Street				
Extend Paine Street (pavement)	3400	60	204,000	4.68
Extend Paine Street (disturbed area)	3400	100	340,000	7.81
Northeast Gate				
Northeast (Command Area) Gate access road (pavement)	1195	30	35,850	0.82
Northeast (Command Area) Gate access road (disturbed area)	1195	70	83,650	1.92
Northeast (Command Area) Gate (pavement)	205	55	11,275	0.26
Northeast (Command Area) Gate (disturbed area)	205	95	19,475	0.45
Northeast (Command Area) Gate (pavement)	125	75	9,375	0.22
Northeast (Command Area) Gate (disturbed area)	125	115	14,375	0.33
Northeast Gate vehicle inspection area (pavement)	210	35	7,350	0.17
Northeast Gate vehicle inspection area (disturbed area)	210	75	15,750	0.36
Northeast Gate guardhouse	80	40	3,200	0.07
Northeast Gate vehicle inspection area (roof area)	80	80	6,400	0.15
VIF and guardhouse disturbed area within pavement area				

Widen Stewart Ave					
Widen Stewart Avenue (pavement)	5950	30	178,500	4.10	
Widen Stewart Avenue (disturbed area)	5950	60	357,000	8.20	
Realign Stewart and Mitchell					
Realign Stewart and Mitchell (Stewart pavement)	2140	60	128,400	2.95	
Realign Stewart and Mitchell (Stewart disturbed area)	2140	120	256,800	5.90	
Realign Stewart and Mitchell (Mitchell pavement)	220	30	6,600	0.15	
Realign Stewart and Mitchell (Mitchell disturbed area)	220	70	15,400	0.35	
East Gate					
East Gate vehicle inspection area (roof area)	80	80	6,400	0.15	
East Gate vehicle inspection area (pavement)	100	80	8,000	0.18	
East Gate vehicle inspection area (access road pavement)	270	50	13,500	0.31	
East Gate vehicle inspection area (pavement)	105	80	8,400	0.19	
East Gate vehicle inspection area (access road pavement)	145	25	3,625	0.08	
East Gate vehicle inspection area (disturbed area)	270	90	24,300	0.56	
East Gate vehicle inspection area (disturbed area)	205	120	24,600	0.56	
East Gate vehicle inspection area (disturbed area)	145	65	9,425	0.22	
East Gate postal inspection area (roof area)	150	100	15,000	0.34	
East Gate postal inspection area (pavement area)	100	80	8,000	0.18	
East Gate postal inspection area (access road pavement)	70	25	1,750	0.04	
East Gate postal inspection area (disturbed area)	250	140	35,000	0.80	
East Gate postal inspection area (disturbed area)	70	65	4,550	0.10	
Total pavement/roof area			**Area (ft)**	**Acres**	
West Gate/Stewart Ave			439,335	10.09	
North Gate			111,300	2.56	
Extend Paine Street			204,000	4.68	
Northeast (Command Area) Gate			70,250	1.61	
Realign Stewart and Mitchell			135,000	3.10	
Widen Stewart Avenue			178,500	4.10	
East Gate			64,675	1.48	
TOTAL			**1,203,060**	**27.62**	
Total area disturbed			**Area (ft)**	**Acres**	
West Gate/Stewart Ave			946,290	21.72	
North Gate			421,500	9.68	
Extend Paine Street			340,000	7.81	
Northeast (Command Area) Gate			133,250	3.06	
Widen Stewart Avenue			357,000	8.20	
Realign Stewart and Mitchell			272,200	6.25	
East Gate			97,875	2.25	
TOTAL			**2,568,115**	**58.96**	
Northeast Gate Alternatives					
Option 2					
Northeast (Command Area) Gate access road (pavement)	1505	30	45,150	1.04	
Northeast (Command Area) Gate access road (disturbed area)	1505	70	105,350	2.42	
Northeast (Command Area) Gate (pavement)	205	55	11,275	0.26	
Northeast (Command Area) Gate (disturbed area)	205	95	19,475	0.45	

Northeast (Command Area) Gate (pavement)	125	75	9,375	0.22	
Northeast (Command Area) Gate (disturbed area)	125	115	14,375	0.33	
Northeast Gate vehicle inspection area (pavement)	210	35	7,350	0.17	
Northeast Gate vehicle inspection area (disturbed area)	210	75	15,750	0.36	
Total impermeable surfaces			**73,150**	**1.68**	
Total disturbed areas			**154,950**	**3.56**	
Option 3					
Northeast (Command Area) Gate access road (pavement)	2715	30	81,450	1.87	
Northeast (Command Area) Gate access road (disturbed area)	2715	70	190,050	4.36	
Northeast (Command Area) Gate (pavement)	205	55	11,275	0.26	
Northeast (Command Area) Gate (disturbed area)	205	95	19,475	0.45	
Northeast Gate vehicle inspection area (pavement)	210	35	7,350	0.17	
Northeast Gate vehicle inspection area (disturbed area)	210	75	15,750	0.36	
Total impermeable surfaces			**100,075**	**2.30**	
Total disturbed areas			**225,275**	**5.17**	
Option 4					
Northeast (Command Area) Gate access road (pavement)	2700	30	81,000	1.86	
Northeast (Command Area) Gate access road (disturbed area)	2700	70	189,000	4.34	
Northeast (Command Area) Gate (pavement)	205	55	11,275	0.26	
Northeast (Command Area) Gate (disturbed area)	205	95	19,475	0.45	
Northeast Gate vehicle inspection area (pavement)	210	35	7,350	0.17	
Northeast Gate vehicle inspection area (disturbed area)	210	75	15,750	0.36	
Total impermeable surfaces			**99,625**	**2.29**	
Total disturbed areas			**224,225**	**5.15**	

Pavement and disturbed areas are estimated on currently available concept drawings. Actual areas could vary somewhat.
Values discussed in EA are rounded up slightly to reflect variability.
Additional disturbed areas are those areas where grading around the perimeter or along the route of features would be needed to stabilize slopes or create the necessary slope adjacent to features.

Table C-5 Cumulative Impacts from Construction and Operation of Facilities at Peterson AFB, CO						
Summary of total emissions						
2006						
Gate and Traffic Upgrades	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Construction West Gate	6.60	0.64	9.75	1.58	3.04	0.16
Construction Extend Paine St	3.05	0.26	4.09	0.66	1.23	0.06
Operations East Gate facilities	0.04	0.00	0.05	0.00	0.00	0.00
Total	**9.68**	**0.90**	**13.89**	**2.23**	**4.27**	**0.22**
ADACG	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Construction Phase I	25.82	2.32	51.85	8.27	34.17	0.62
Total	**25.82**	**2.32**	**51.85**	**8.27**	**34.17**	**0.62**
BX Commissary	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Construction (second year)	8.48	0.70	11.42	1.79	3.84	0.24
Heating (partial year)	0.17	0.01	0.20	0.00	0.02	0.00
Storage tanks (partial year)	0.00	2.10	0.00	0.00	0.00	0.15
Vehicle refueling (partial year)	0.00	3.25	0.00	0.00	0.00	0.27
Total	**8.65**	**6.06**	**11.62**	**1.79**	**3.86**	**0.66**
Total all projects	**44.16**	**9.28**	**77.36**	**12.29**	**42.30**	**1.50**
2007						
Gate and Traffic Upgrades	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Construction West Gate	6.60	0.64	9.75	1.58	3.04	0.16
Construction Extend Paine St	3.05	0.26	4.09	0.66	1.23	0.06
Operations East Gate facilities	0.04	0.00	0.05	0.00	0.00	0.00
Total	**9.68**	**0.90**	**13.89**	**2.23**	**4.27**	**0.22**
ADACG	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Construction Phase II (partial)	5.97	0.33	3.75	0.60	10.19	0.05
Total	**5.97**	**0.33**	**3.75**	**0.60**	**10.19**	**0.05**
BX Commissary	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Heating	0.51	0.03	0.61	0.00	0.05	0.01
Storage tanks	0.00	6.30	0.00	0.00	0.00	0.46
Vehicle refueling	0.00	9.74	0.00	0.00	0.00	0.82
Total	**0.51**	**16.07**	**0.61**	**0.00**	**0.05**	**1.29**
Total all projects	**16.16**	**17.30**	**18.25**	**2.83**	**14.51**	**1.57**
Future year operations						
	CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Gate Upgrades						
Operations, all gates	0.12	0.01	0.14	0.00	0.01	0.00
Total	**0.12**	**0.01**	**0.14**	**0.00**	**0.01**	**0.00**

ADACG	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Furnaces, boilers	0.16	0.01	0.20	0.00	0.01	0.00
JP-8 storage and refueling	0.00	0.84	0.00	0.00	0.00	0.04
Ground transportation	1.55	0.39	0.68	0.04	6.65	0.02
Aircraft	5.68	0.54	36.62	0.67	4.87	0.00
Total	**7.40**	**1.78**	**37.50**	**0.72**	**11.53**	**0.06**
BX Commissary	**CO**	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Heating	0.51	0.03	0.61	0.00	0.05	0.01
Storage tanks	0.00	6.30	0.00	0.00	0.00	0.46
Vehicle refueling	0.00	9.74	0.00	0.00	0.00	0.82
Total	**0.51**	**16.07**	**0.61**	**0.00**	**0.05**	**1.29**
Total all projects	**8.03**	**17.86**	**38.25**	**0.72**	**11.59**	**1.35**

Stationary Sources

2006						
	CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Gate and Traffic Upgrades						
Construction- Batch Mix Asphalt Plant[1]	2.65	0.05	0.17	0.03	0.18	0.00
Construction- Batch Mix Asphalt Plant[2]	1.26	0.03	0.08	0.01	0.08	0.00
Construction-Fugitive Dust[1]					2.32	
Construction-Fugitive Dust[2]					0.93	
East Gate facilities (heating)	0.04	0.00	0.05	0.00	0.00	0.00
Total	**3.95**	**0.08**	**0.29**	**0.05**	**3.51**	**0.00**
[1] West Gate Construction (plant is assumed to be offsite) [2] Extend Paine Street Construction (plant is assumed to be offsite)						
ADACG						
Construction- Batch Mix Asphalt Plant[1]	6.39	0.13	0.40	0.07	0.43	0.00
Construction-Fugitive Dust					30.57	
Total	**6.39**	**0.13**	**0.40**	**0.07**	**31.00**	**0.00**
[1] Plant would likely be onsite due to volume of project						
BX Commissary						
Construction- Batch Mix Asphalt Plant[1]	2.94	0.06	0.19	0.04	0.20	0.00
Construction-Fugitive Dust					3.06	
Heating (partial year)	0.17	0.01	0.20	0.00	0.02	0.00
Storage tanks (partial year)	0.00	2.10	0.00	0.00	0.00	0.15
Vehicle refueling (partial year)	0.00	3.25	0.00	0.00	0.00	0.27
Total	**3.11**	**5.42**	**0.39**	**0.04**	**3.28**	**0.42**
Total all projects	**13.45**	**5.63**	**1.08**	**0.15**	**37.78**	**0.42**
Current stationary sources	17.98	48.94	24.48	0.35	10.52	4.54
Total with all projects	**31.43**	**54.57**	**25.56**	**0.50**	**48.30**	**4.96**

2007						
	CO	VOC	NOx	SOx	PM-10	HAPs
Gate and Traffic Upgrades						
Construction- Batch Mix Asphalt Plant[1]	2.65	0.05	0.17	0.03	0.18	0.00
Construction- Batch Mix Asphalt Plant[2]	1.26	0.03	0.08	0.01	0.08	0.00
Construction-Fugitive Dust[1]					2.32	
Construction-Fugitive Dust[2]					0.93	
East Gate facilities (heating)	0.04	0.00	0.05	0.00	0.00	0.00
Total	**3.95**	**0.08**	**0.29**	**0.05**	**3.51**	**0.00**
[1] West Gate Construction (plant is assumed to be offsite) [2] Extend Paine Street Construction (plant is assumed to be offsite)						
ADACG						
Construction- Batch Mix Asphalt Plant	3.64	0.07	0.23	0.04	0.25	0.00
Construction-Fugitive Dust					9.76	
Total	**3.64**	**0.07**	**0.23**	**0.04**	**10.01**	**0.00**
BX Commissary						
Heating	0.51	0.03	0.61	0.00	0.05	0.01
Storage tanks	0.00	6.30	0.00	0.00	0.00	0.46
Vehicle refueling	0.00	9.74	0.00	0.00	0.00	0.82
Total	**0.51**	**16.07**	**0.61**	**0.00**	**0.05**	**1.29**
Total all projects	**8.10**	**16.23**	**1.13**	**0.09**	**13.57**	**1.29**
Current stationary sources	17.98	48.94	24.48	0.35	10.52	4.54
Total with all projects	**26.08**	**65.17**	**25.61**	**0.44**	**24.09**	**5.83**
Future year operations						
	CO	VOC	NOx	SOx	PM-10	HAPs
Gate Upgrades						
Operations, all gates (boilers)	0.12	0.01	0.14	0.00	0.01	0.00
Total	**0.12**	**0.01**	**0.14**	**0.00**	**0.01**	**0.00**
ADACG						
Furnaces, boilers	0.16	0.01	0.20	0.00	0.01	0.00
JP-8 storage and refueling	0.00	0.84	0.00	0.00	0.00	0.04
Total	**0.16**	**0.85**	**0.20**	**0.00**	**0.01**	**0.04**
BX Commissary						
Heating	0.51	0.03	0.61	0	0.05	0.01
Storage tanks	0	6.3	0	0	0	0.46
Vehicle refueling	0	9.74	0	0	0	0.82
Total	**0.51**	**16.07**	**0.61**	**0**	**0.05**	**1.29**
Total all projects	**0.79**	**16.93**	**0.95**	**0.00**	**0.08**	**1.33**
Current stationary sources	17.98	48.94	24.48	0.35	10.52	4.54
Total with all projects	**18.77**	**65.87**	**25.43**	**0.35**	**10.60**	**5.87**

Potential to Emit (Stationary Sources)						
			2006			
	CO	VOC	NOx	SOx	PM-10	HAPs
Gate and Traffic Upgrades						
Construction- Batch Mix Asphalt Plant[1]	2.65	0.05	0.17	0.03	0.18	0.00
Construction- Batch Mix Asphalt Plant[2]	1.26	0.03	0.08	0.01	0.08	0.00
Construction-Fugitive Dust[1]					2.32	
Construction-Fugitive Dust[2]					0.93	
East Gate facilities (heating)	0.08	0.01	0.10	0.00	0.01	0.00
Total	**3.95**	**0.08**	**0.29**	**0.05**	**3.51**	**0.00**
[1] West Gate Construction (plant is assumed to be offsite) [2] Extend Paine Street Construction (plant is assumed to be offsite)						
ADACG						
Construction- Batch Mix Asphalt Plant[1]	6.39	0.13	0.40	0.07	0.43	0.00
Construction-Fugitive Dust					30.57	
Total	**6.39**	**0.13**	**0.40**	**0.07**	**31.00**	**0.00**
[1] Plant would likely be onsite due to volume of project						
BX Commissary						
Construction- Batch Mix Asphalt Plant[1]	2.94	0.06	0.19	0.04	0.20	0.00
Construction-Fugitive Dust					3.06	
Heating (partial year)	0.34	0.02	0.40	0.00	0.04	0.00
Storage tanks (partial year)	0.00	-0.21	0.00	0.00	0.00	-0.02
Vehicle refueling (partial year)	0.00	3.41	0.00	0.00	0.00	0.27
Total	**3.28**	**3.28**	**0.59**	**0.04**	**3.30**	**0.26**
Total all projects	**13.62**	**3.49**	**1.28**	**0.15**	**37.81**	**0.26**
Current stationary sources	50.03	122.13	147.89	5.25	126.24	10.12
Total with all projects	**63.65**	**125.62**	**149.17**	**5.40**	**164.05**	**10.38**
			2007			
	CO	VOC	NOx	SOx	PM-10	HAPs
Gate and Traffic Upgrades						
Construction- Batch Mix Asphalt Plant[1]	2.65	0.05	0.17	0.03	0.18	0.00
Construction- Batch Mix Asphalt Plant[2]	1.26	0.03	0.08	0.01	0.08	0.00
Construction-Fugitive Dust[1]					2.32	
Construction-Fugitive Dust[2]					0.93	
East Gate facilities (heating)	0.08	0.01	0.10	0.00	0.01	0.00
Total	**3.95**	**0.08**	**0.29**	**0.05**	**3.51**	**0.00**
[1] West Gate Construction (plant is assumed to be offsite) [2] Extend Paine Street Construction (plant is assumed to be offsite)						
ADACG						
Construction- Batch Mix Asphalt Plant[1]	6.39	0.13	0.40	0.07	0.43	0.00
Construction-Fugitive Dust					30.57	
Total	**6.39**	**0.13**	**0.40**	**0.07**	**31.00**	**0.00**
[1] Plant would likely be onsite due to volume of project						
BX Commissary						

Heating	1.02	0.07	1.21	0.01	0.09	0.01
Storage tanks	0.00	-0.63	0.00	0.00	0.00	-0.05
Vehicle refueling	0.00	10.22	0.00	0.00	0.00	0.81
Total	**1.02**	**9.66**	**1.21**	**0.01**	**0.09**	**0.78**
Total all projects	**11.36**	**9.87**	**1.90**	**0.13**	**34.60**	**0.78**
Current stationary sources	50.03	122.13	147.89	5.25	126.24	10.12
Total with all projects	**61.39**	**132.00**	**149.79**	**5.38**	**160.84**	**10.90**
Future year operations						
	CO	**VOC**	**NOx**	**SOx**	**PM-10**	**HAPs**
Gate Upgrades						
Operations, all gates (boilers)	0.24	0.02	0.28	0.00	0.02	0.00
Total	**0.24**	**0.02**	**0.28**	**0.00**	**0.02**	**0.00**
ADACG						
Furnaces, boilers	0.33	0.02	0.39	0.00	0.03	0.01
JP-8 storage and refueling	0.00	1.26	0.00	0.00	0.00	0.05
Total	**0.33**	**1.29**	**0.39**	**0.00**	**0.03**	**0.06**
BX Commissary						
Heating	1.02	0.07	1.21	0.01	0.09	0.01
Storage tanks	0.00	-0.63	0.00	0.00	0.00	-0.05
Vehicle refueling	0.00	10.22	0.00	0.00	0.00	0.81
Total	**1.02**	**9.66**	**1.21**	**0.01**	**0.09**	**0.78**
Total all projects	**1.59**	**10.96**	**1.88**	**0.01**	**0.14**	**0.84**
Current stationary sources	50.03	122.13	147.89	5.25	126.24	10.12
Total with all projects	**51.62**	**133.09**	**149.77**	**5.26**	**126.38**	**10.96**

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